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78K, V850 Microcontrollers
Development Environment

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2008 · July

78K, V850 Microcontroller Development Environment

This pamphlet introduces the development environment provided by NEC Electronics, for the development of 78K and V850 microcontroller application products.

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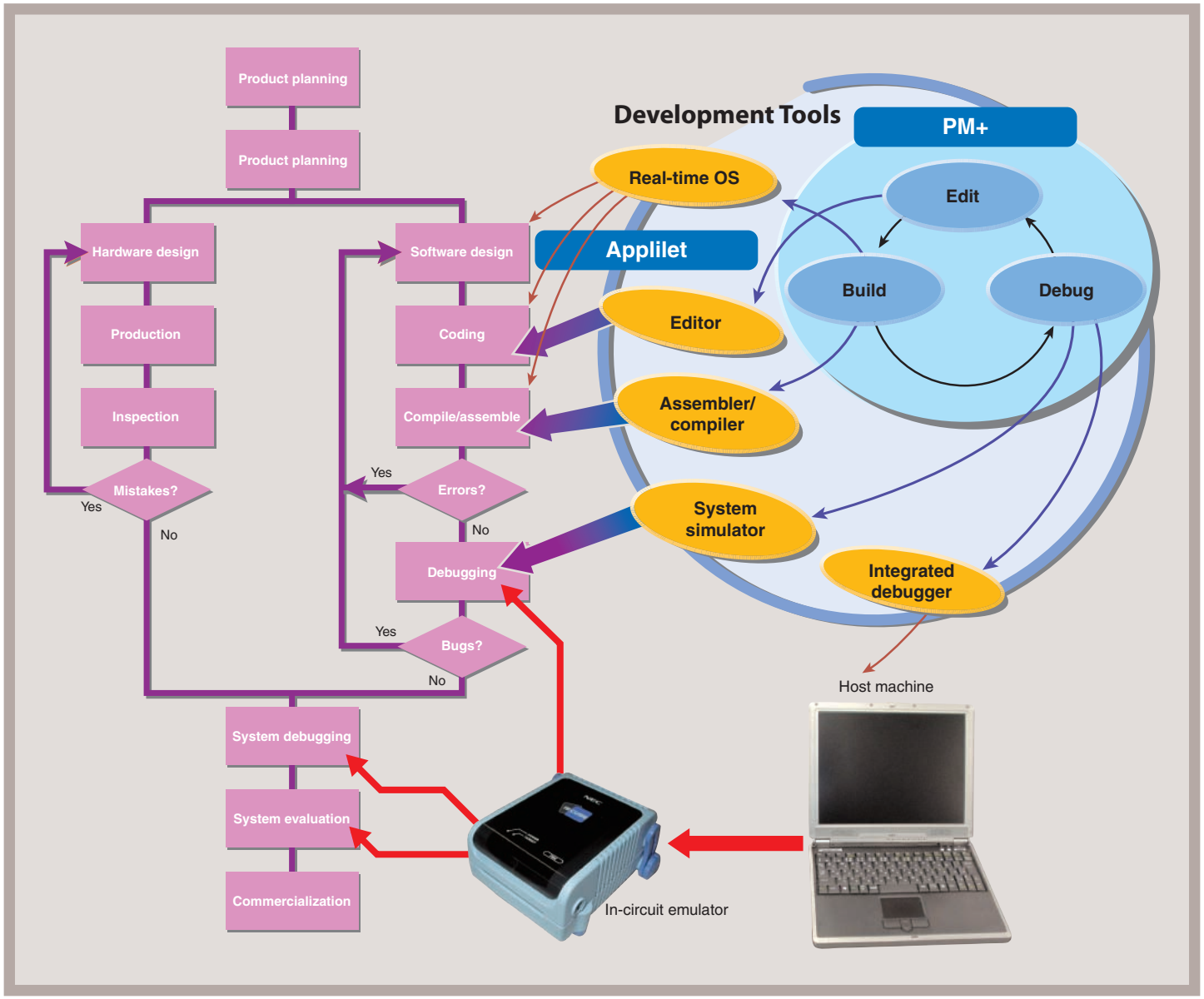
78K MICROCONTROLLER DEVELOPMENT ENVIRONMENT

Overview of 78K Development Environment

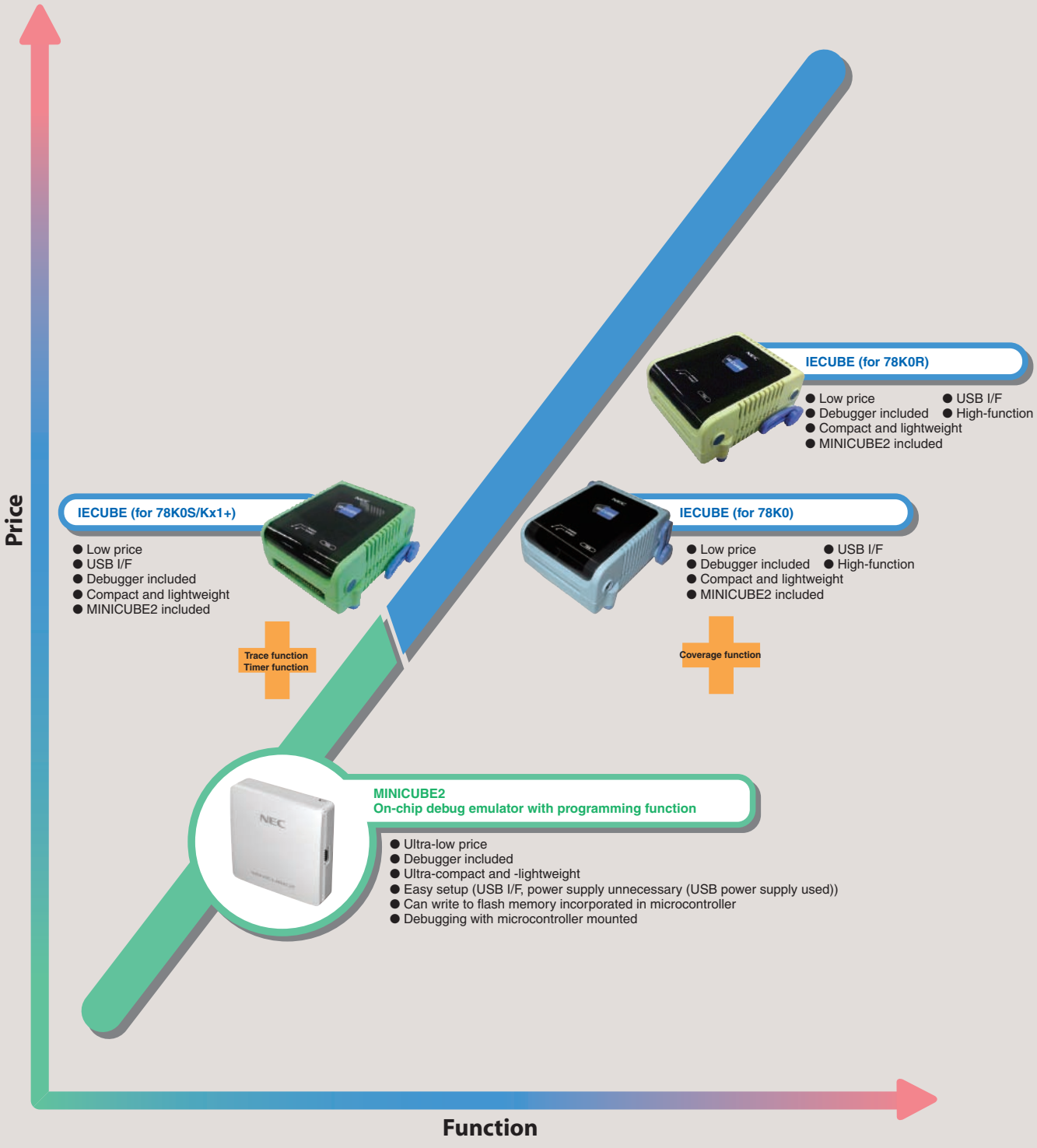
NEC Electronics provides various development tools which help reduce development time and cost for efficient development of 78K0/Kx1, 78K0/Kx1+, μPD78F0714, 78K0/Fx1+, 78K0/Kx2, 78K0/Lx2, 78K0/Fx2, 78K0/Lx3, 78K0S/Kx1+, and 78K0R/Kx3 application products.
These development tools can be integrated in Windows™ using Project Manager (PM+), and this integration realizes a development environment that remarkably enhances their usability.

The relationship between the development procedure of the application products and development tools are illustrated below.



IN-CIRCUIT EMULATOR PRODUCT LINEUP

The product lineup of in-circuit emulators has been expanded to meet the needs for debug functions



SOFTWARE PACKAGES

The following software packages are available.

SP78K0: 78K0 software package
SP78K0S: 78K0S software package
SP78K0R: 78K0R software package

The following software tools for development are packaged in a single CD media, so they are available for an affordable price.

- ◆ Assembler package
  - Assembler
  - Linker
  - Object converter
  - Librarian
  - List converter
  - Structured assembler preprocessor (SP78K0, SP78K0S)
  - PM+
- ◆ C compiler
- ◆ Integrated debugger
- ◆ System simulator[Note]
- ◆ Device file

Each tool is upgraded for the addition or enhancement of functions. In conjunction with this, other tools may also have to be upgraded as a tool chain. To cope with this load, the software package is released with the latest packaged versions of the tools.
The tools included in the software package are the latest versions when the software package is released, and each tool may be upgraded individually afterwards. The latest version is available on the Development Tools Download (ODS) webpage. (Refer to **Development Tools Download Service** on page 86 for details.)

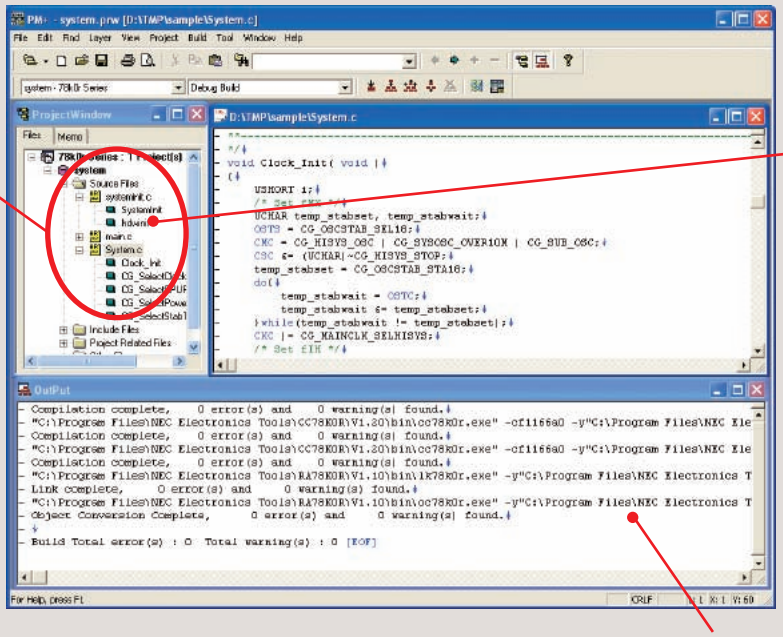
Note The 78K0R/Kx3, 78K0/Kx2, and 78K0S/Kx1+ are supported by system simulator SM+.

PROJECT MANAGER (PM+)

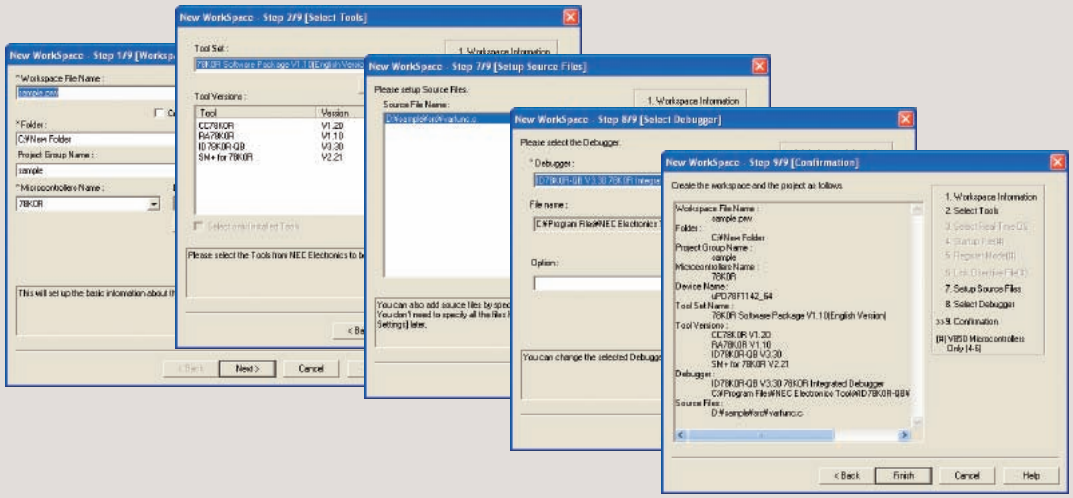
The project manager enables more efficient development by integrating tools such as a C compiler and debugger.

Features

- ◆ Enables editing, build, and debugging, as a series of operations
- ◆ Includes an editor function
  Includes a smart look-up function that provides a short-cut for coding function names and task names
- ◆ Menus and tool bars can be customized


Source file group
Click function name or task name from source file to jump to corresponding location in source code
Build execution progress display

- ◆ Wizards can be used to create projects



ASSEMBLER PACKAGES

The following assembler packages are available.

RA78K0: 78K0 assembler package
RA78K0S: 78K0S assembler package
RA78K0R: 78K0R assembler package

The assembler package is the generic name for a series of programs that convert source programs for the 78K0, 78K0S, and 78K0R, which are described in the assembly language, into the code described in the machine language. The RA78K0, RA78K0S, and RA78K0R include the following six programs.

- **Structured assembler preprocessor (RA78K0, RA78K0S)**
- **Assembler**
- **Linker**
- **Object converter**
- **Librarian**
- **List converter**

In addition to the above programs, the RA78K0, RA78K0S, and RA78K0R include the Project Manager that is used to integrate each development tool.
The Project Manager provides the development environment in Windows, and creates the integrated development environment that consists of development tools such as the editor, builder, debugger, etc.

Features

◆ Supports structured assembly language
The structured assembly language, which enables the C-language-like control structure and assignment, is supported, so that a program with high maintenance performance can easily be described.

◆ Output of diagnosis information
Various diagnosis lists, such as the assemble list, symbol list, cross-reference list, error list, etc., to help with debugging.

◆ Macro function
The macro function that is used to define similar instructions as one macro instruction is supported. This function enables reduction of the coding amount, and thereby contributes to the development of a high-quality program.

◆ Conditional assembly function
The conditional assembly function that enables the setting of the conditional assembly for a part of the source program is supported. This function enables unified management in source programs that partially vary depending on the model, thereby enhancing the maintenance performance.

◆ Optimization of branch instruction
The branch instruction automatic select directive (BR directive) is provided. This enables the assembler to generate the branch instruction appropriate for the branch destination range.

C COMPILERS

The following C compilers are available.

CC78K0: 78K0 C compiler
CC78K0S: 78K0S C compiler
CC78K0R: 78K0R C compiler

The CC78K0, CC78K0S, and CC78K0R are versatile, highly portable C compilers that were developed for describing the embedded control program for a 78K0, 78K0S, or 78K0R single-chip microcontroller in the C language. These compilers contribute significantly to reducing the development period and the time it takes to develop.
In addition to the standard C language specifications, and the extended specifications unique to the 78K0, 78K0S, and 78K0R is supported to enhance its practicality and to significantly expand the application range of the C language.

Features

◆ Conforming to ANSI C
Conforms to ANSI C standard, the standard specifications for C language
Remark ANSI: American National Standards Institute

◆ Support of extended specifications unique to 78K0, 78K0S, and 78K0R
Extended specifications are provided so that the controls in the peripheral hardware incorporated in the 78K0, 78K0S, and 78K0R and interrupt servicing can be described easily using the C language, and the ROM/RAM efficiency can be enhanced.

◆ Emphasized ROM/RAM efficiency
- Powerful optimization enables outputting of compact codes.
- Can allocate external variables to the saddr area[Note] (sreg variable), and function arguments and automatic variables to the saddr area or registers (norec, noauto functions).
  Consequently the code size can be reduced, thereby programs run faster.
  Note An area that can be accessed using the instruction with a small number of bytes, which is allocated to a part of the 78K0, 78K0S, and 78K0R internal RAM. With various transfer and arithmetic instructions, these compilers are excellent particularly in terms of usability.
- Data can be defined and manipulated in 1-bit units using 78K0, 78K0S, and 78K0R bit manipulation instructions
- Can describe functions that can be called using a short instruction (callt, callf functions).

◆ Aware of built-in controls
- Peripheral hardware incorporated in the 78K0, 78K0S, and 78K0R can be controlled directly using the C language.
- Interrupt servicing can be described directly using the C language (register bank switchable).
- Using the built-in functions, and special instructions such as disabling-enabling interrupts and rotate instructions can be output.
- Assembler's codes can be described in the C source.

◆ Supports libraries that are effective for built-in applications
Among the standard library functions prescribed in the ANSI C standard, the functions that are also effective for built-in applications are supported.
The library's source programs (sold separately) are provided for reference.

◆ Output of function information
Information on definition functions, such as the size and stack count that are statically calculated, are output to the assembler source module file.

◆ Included utilities
The CC78K0 is provided with utilities useful for developing integrated systems.
- Stack estimation tool (SK78K0, SK78K0S, SK78K0R)
  Statically estimates the stack size used by a function group within a project.
- Bank arrangement help tool (BS78K0)
  Places the C source file into an optimal area (shared area or bank area) in accordance with the information (file code size, number of functions being referenced) output by 78K0 C compiler CC78K0.
  Caution The CC78K0, CC78K0S, and CC78K0R do not support double-precision floating points. For details, see the respective user's manuals.

INTEGRATED DEBUGGERS

The following integrated debuggers are available.

ID78K0-QB: 78K0 debugger (target emulators: IECUBE, MINICUBE2)
ID78K0-NS: 78K0 debugger (target emulator: IE-78K0-NS(-A))
ID78K0S-QB: 78K0S debugger (target emulators: IECUBE, MINICUBE2)
ID78K0S-NS: 78K0S debugger (target emulator: IE-78K0S-NS(-A))
ID78K0R-QB: 78K0R debugger (target emulators: IECUBE, MINICUBE2)

These integrated debuggers operate in the PC in which Windows OS is installed, and provides a user-friendly GUI (Graphical User Interface).
Often-used commands are organized as buttons, and can be activated by simply clicking the mouse, which provide an environment with a higher usability.

Remark Debuggers for the IECUBE and MINICUBE2 (ID78K0-QB, ID78K0S-QB, ID78K0R-QB) are included in the emulator.

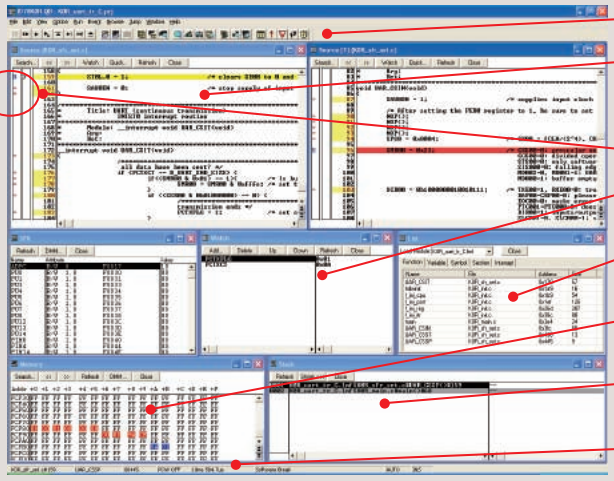
Features

◆ Source debugging possible
Source debugging with C source programs or assembly language programs is possible. Mixed display is also possible, so a critical part can be debugged easily.

◆ Wealth of debug functions
The event function of the in-circuit emulator (IE) can be used to perform various debug operations, such as breaks, tracing, time measurement, and coverage measurement.
Furthermore, the event function can also be used for on-chip debugging (OCD) to perform basic debug operations, such as breaks and Run-Break time measurement.

◆ Saves/restores debugging environment
A debug environment such as information on settings of break points and events, file downloading, display state and position of windows can be saved in a file (project file), and the saved debug environment can be restored by loading the file.

◆ Storing and restoring the debugging environment
The setting information of break points and events, download information of files, and debug environment such as the window display status and position, can be saved to a file (project file). This file can be loaded to restore the debugging environment.



Frequently used functions are registered on the tool bar.
Can debug at the C source level
Can perform a mixed display of the assembly language that corresponds to the C source
Can set break points by using a single button
Can immediately check the values of frequently seen variables by watch-registration
Can display function names, addresses, and sizes in a list
Memory window enabling the identification of read and write traces (when IECUBE is used)
Can check call functions and local variables in the stack frame information
The time from the start until stop of execution is displayed.

SYSTEM SIMULATORS

The following system simulators are available.

SM+ for 78K0R/Kx3:	Instruction + peripheral simulator for 78K0R/KE3, 78K0R/KF3, 78K0R/KG3, 78K0R/KH3 (planned to be supported), and 78K0R/KJ3 (planned to be supported)
SM+ for 78K0R:	Instruction simulator for 78K0R
SM+ for 78K0/Kx2:	Instruction + peripheral simulator for 78K0/KB2, 78K0/KC2, 78K0/KD2, 78K0/KE2, and 78K0/KF2
SM+ for 78K0:	Instruction simulator for 78K0
SM78K0:	Instruction + peripheral simulator for 78K0[Note]
SM+ for 78K0S/Kx1+:	Instruction + peripheral simulator for 78K0S/KU1+ (planned to be supported), 78K0S/KY1+, 78K0S/KA1+, and 78K0S/KB1+
SM+ for 78K0S (under development):	Instruction simulator for 78K0S
SM78K0S:	Instruction + peripheral simulator for 78K0S[Note]

Instruction + peripheral simulator: **Can simulate the execution of CPU instructions and internal peripheral functions, such as timers and UART (sold separately from the software package).**

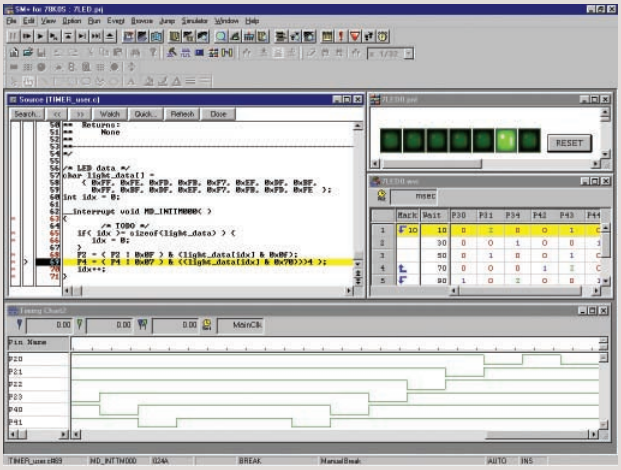
Instruction simulator: **Can only simulate the execution of CPU instructions (included with the software package).**

Note The target devices are mainly those before ALL FLASH.
For details, refer to **Microcontroller Development Tools Selection Guide (U18459E) (to be released)**.

The system simulators listed above are high-functional and easy-to-operate system simulators that can perform simulation of internal peripheral functions (such as timers and serial interfaces) of a microcontroller, and external components (such as LEDs and alarms).

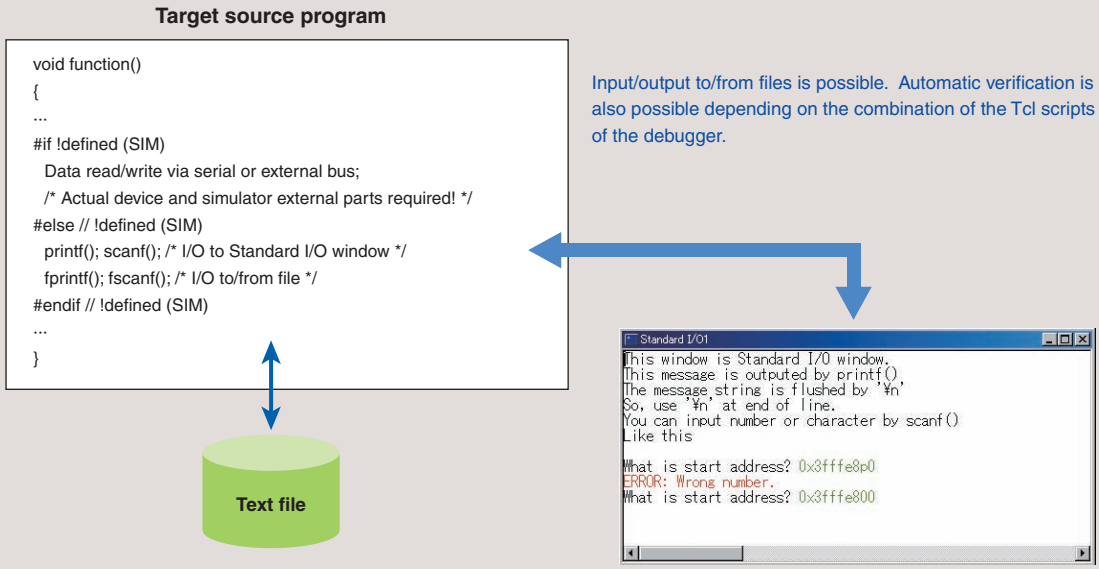
Features

- ◆ Realizes effective debugging using the original functions (such as waveform observation and external component connection) of the simulator.
- ◆ Same GUI design as that of an integrated debugger
- ◆ Source debugging possible
- ◆ Like in-circuit emulators, break event and trace functions are implemented
- ◆ Monitoring function (display auto-refresh function when program execution is stopped)
- ◆ Saves/restores debugging environment
- ◆ Batch execution and custom window creation via command



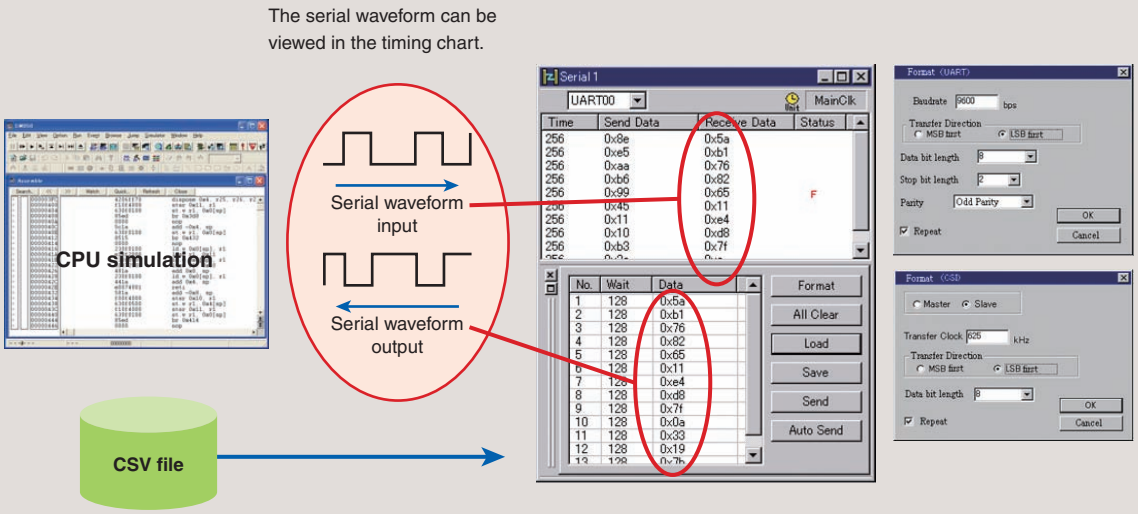
◆ Standard I/O window

- Logic verification can be implemented easily with printf, scanf, fprintf, and fscanf.


Target source program
void function()
{
...
#if !defined (SIM)
Data read/write via serial or external bus;
/* Actual device and simulator external parts required! */
#else // !defined (SIM)
printf(); scanf(); /* I/O to Standard I/O window */
fprintf(); fscanf(); /* I/O to/from file */
#endif // !defined (SIM)
...
}
Text file
Input/output to/from files is possible. Automatic verification is also possible depending on the combination of the Tcl scripts of the debugger.
Standard I/O1
This window is Standard I/O window.
This message is outputed by printf()
The message string is flushed by '¥n'
So, use '¥n' at end of line.
You can input number or character by scanf()
Like this
What is start address? 0x3fffe8p0
ERROR: Wrong number.
What is start address? 0x3fffe800

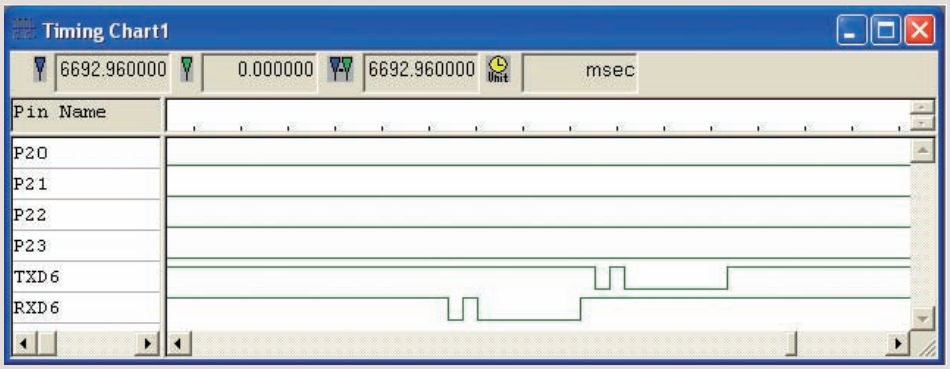
◆ Serial window

- The serial waveform can be generated and output by describing transfer values by setting the transfer rate, etc.
- Input from the CSV-format file in which transfer values are described is also possible.



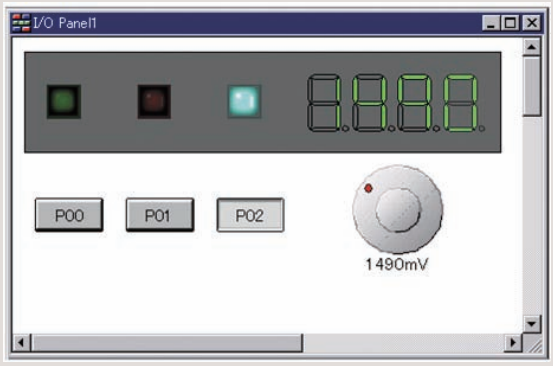
◆ Timing chart window

• Microcontroller I/O waveforms can be monitored in an oscilloscope-like image.



◆ I/O panel window

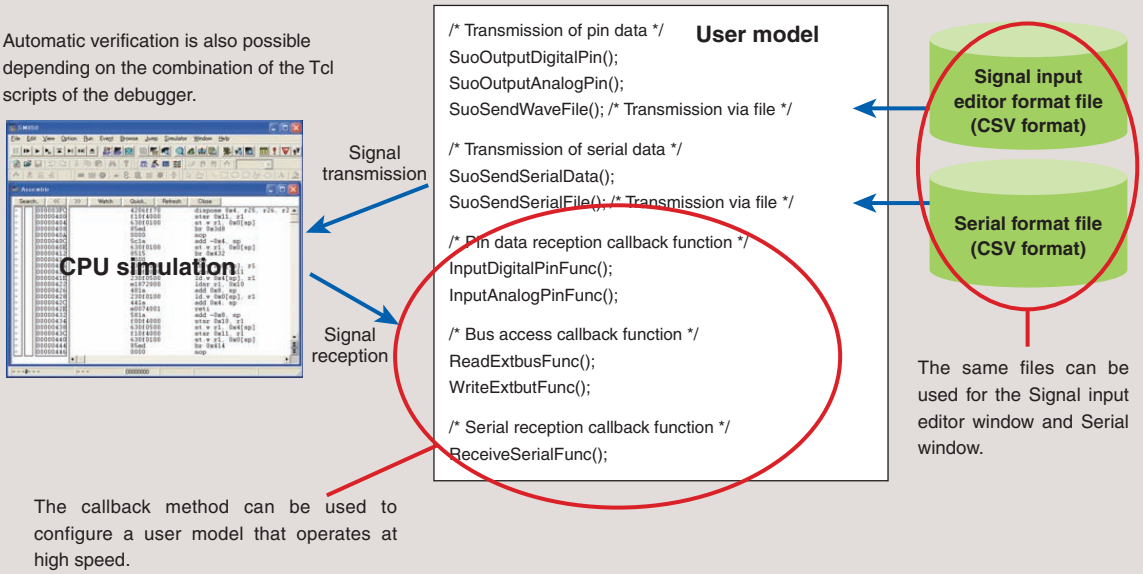
• Simulation can be performed with basic external components, such as buttons, LEDs, and level gages connected.



The panel can be created with the same operation as Microsoft PowerPoint.

◆ User-open interface

• Functions of the Signal input editor window and Serial window can be used via the user-open interface.


Automatic verification is also possible depending on the combination of the Tcl scripts of the debugger.
CPU simulation
Signal transmission
Signal reception
/* Transmission of pin data */
SuoOutputDigitalPin();
SuoOutputAnalogPin();
SuoSendWaveFile(); /* Transmission via file */
/* Transmission of serial data */
SuoSendSerialData();
SuoSendSerialFile(); /* Transmission via file */
/* Pin data reception callback function */
InputDigitalPinFunc();
InputAnalogPinFunc();
/* Bus access callback function */
ReadExtbusFunc();
WriteExtbutFunc();
/* Serial reception callback function */
ReceiveSerialFunc();
User model
Signal input editor format file (CSV format)
Serial format file (CSV format)
The same files can be used for the Signal input editor window and Serial window.
The callback method can be used to configure a user model that operates at high speed.

Remark All screen images are screenshots of the SM+. The functions of the SM78K0 and SM78K0S vary slightly.

μITRON SPECIFICATION-COMPLIANT REAL-TIME OS

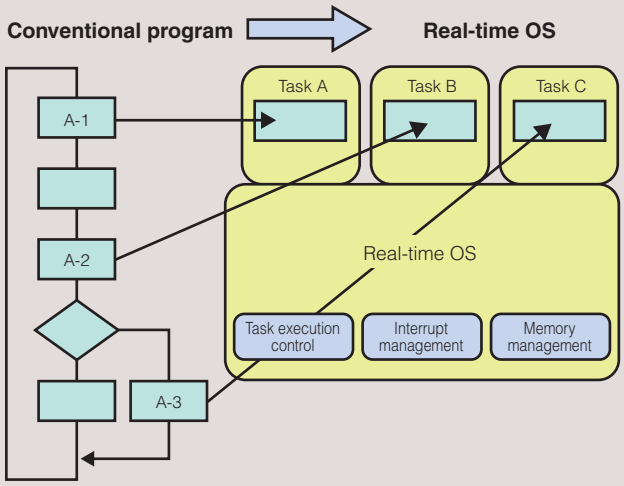
The following μITRON specification-compliant real-time OS is supported by the 78K0R microcontrollers.

RX78K0R: μITRON4.0 specification-compliant real-time OS for 78K0R microcontrollers

Why is a real-time OS needed?

With the recent advances in the performance and functionality of microcontrollers, not only have the systems to be developed become more complex, but also the quantity of the programs to be executed by these systems has increased. Because systems in the field of control equipment in particular are required to respond immediately to changes in external and internal events, many problems that cannot be solved by conventional interrupt servicing have arisen; hence the development of the real-time OS.

The real-time OS is designed to react promptly to event changes and interrupts and manages multiple processing programs by dividing them into task units, which are then executed in the optimal order.



Real-time OS advantages

<For designing>
- ◆ Facilitates creation of application modules
- ◆ Software development can be focused solely on the application
- ◆ Management of program in task units
- ◆ Tasks can be set individually by prescribing an inter-task communication mode

<For debugging>
- ◆ Discrete task debugging enables multiple operators to debug simultaneously
- ◆ Only inter-task communication and synchronization testing are required for integrated debugging

<For program maintenance>
- ◆ Specification changes and function additions can be executed in task units, reducing the effect on the system as a whole
- ◆ Because the program consists of task units:
  - → The internal structure is simplified, resulting in greater program legibility
  - → The program can be reused in task units, even in other systems

Specification	μITRON4.0
Corresponding memory pool	Fixed length
Dynamic generation and deletion of resources	Not available
Task debugger	Available
System performance analyzer	Available

Applilet

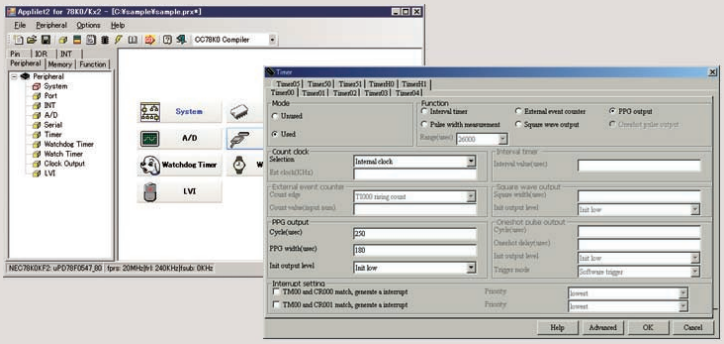
The following device driver configuration tools are available.

Applilet for 78K0S/Kx1+:	Device driver configuration tool for 78K0S/KA1+
Applilet2 for 78K0R/Kx3:	Device driver configuration tool for 78K0R/KE3, 78K0R/KF3, and 78K0R/KG3
Applilet2 for 78K0/Kx2:	Device driver configuration tool for 78K0/KB2, 78K0/KC2, 78K0/KD2, 78K0/KE2, and 78K0/KF2
Applilet2 for 78K0/Fx2:	Device driver configuration tool for 78K0/FC2, 78K0/FE2, and 78K0/FF2
Applilet2 for 78K0/Lx2:	Device driver configuration tool for 78K0/LE2, 78K0/LF2, 78K0/LG2, 78K0/LC3, 78K0/LD3, 78K0/LE3, and 78K0/LF3

Using Applilet, setting sources for the on-chip peripheral functions can be generated automatically, just by selecting and inputting relevant parameters, without referencing the user's manual of the device.

Operation Procedure

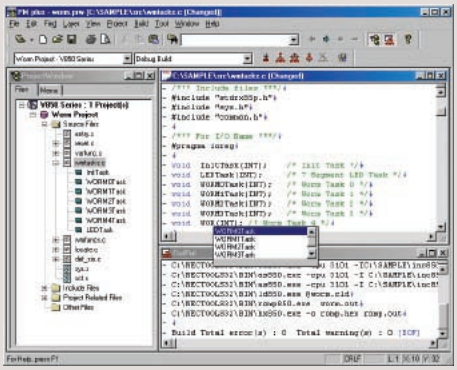
1. **Setting of on-chip peripheral functions**
   Select the target device then set the on-chip peripheral functions to be used, as necessary.



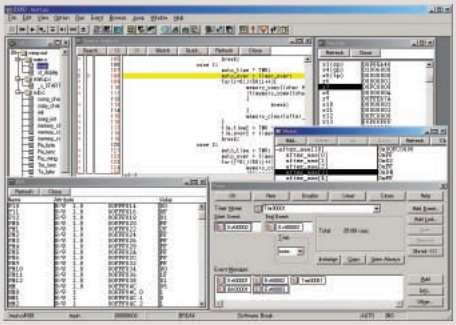
2. **Code generation**
   Source files are created automatically for each function.

3. **Addition/change of codes as necessary**

4. **Build**
   A project file for the Project Manager has been created automatically. Load the project file then perform build on the target object.

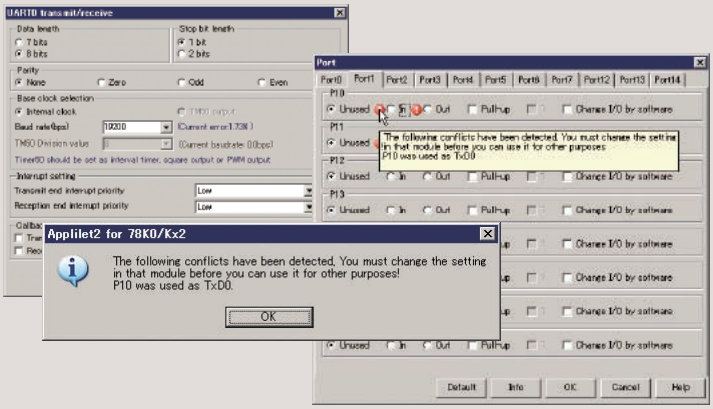


5. **Debug**
   Debug the code using the debugger and simulator.



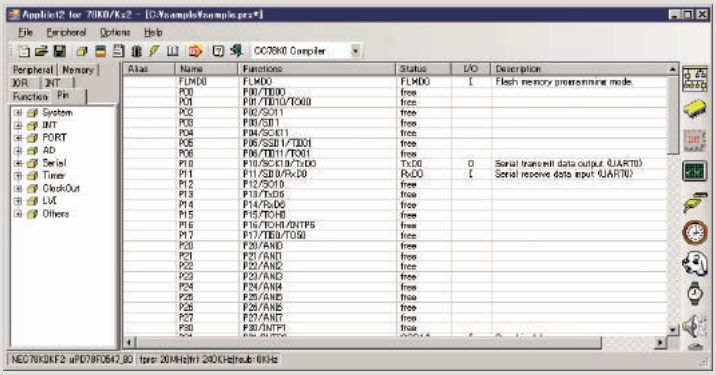
◆ Interactive input and check for resource contention

Each port has alternate functions, as well as the digital I/O port function. Resource contention can be checked so that its use as the I/O port function, nor are its use as the alternate functions duplicated.


Applilet2 for 78K0/Kx2
The following conflicts have been detected. You must change the setting in that module before you can use it for other purposes!
P10 was used as TxD0.
OK

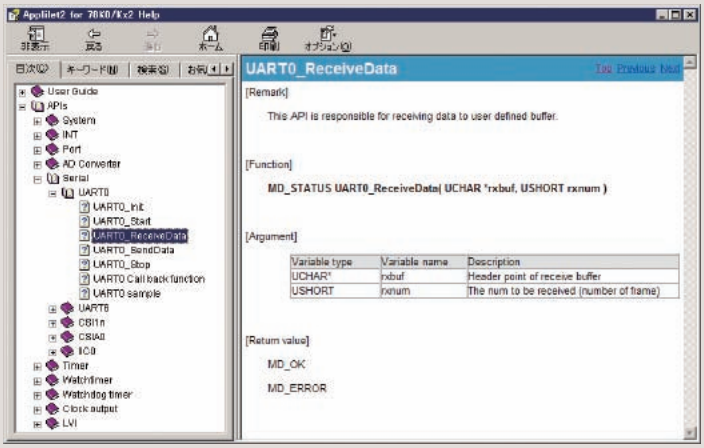
◆ Alias of ports

Alternate functions of each port can be referenced.



◆ Online help

Descriptions on functions in automatically created sources can be referenced.


UART0_ReceiveData
[Remark]
This API is responsible for receiving data to user defined buffer.
[Function]
MD_STATUS UART0_ReceiveData(UCHAR *rxbuf, USHORT rxnum)
[Argument]
Variable type | Variable name | Description
UCHAR* | rxbuf | Header point of receive buffer
USHORT | rxnum | The num to be received (number of frame)
[Return value]
MD_OK
MD_ERROR

78K0R IECUBE

The following IECUBE series in-circuit emulator is supported by the 78K0R.

QB-78K0RKX3: 78K0R/KE3, 78K0R/KF3, 78K0R/KG3, 78K0R/KH3, 78K0R/KJ3
QB-78K0RIX3: 78K0R/IB3, 78K0R/IC3, 78K0R/ID3, 78K0R/IE3, 78K0R/KC3-L, 78K0R/KD3-L, 78K0R/KE3-L

Features

◆ Low price
- 1/3 to 1/4 price of existing high-performance emulator (IE-78K0-NS)
- Debugger (ID78K0R-QB) and on-chip debug emulator with programming function (MINICUBE2) included

◆ Easy setup
- Combined in-circuit emulator and emulation board
- USB 2.0 interface supported (compatible with Hi-Speed USB I/F and USB 1.1)

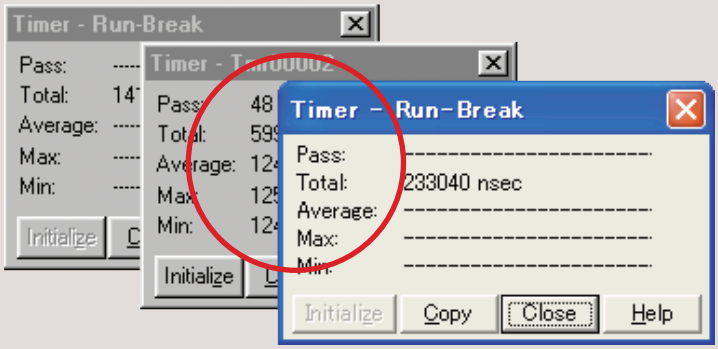
◆ Enhanced and added functions
- Functions equivalent to high-performance emulator
- Frequently-used functions enhanced, useful functions added

◆ Reinforced maintainability
- Self-diagnostic function mounted

◆ Compact and lightweight
- Palm-sized

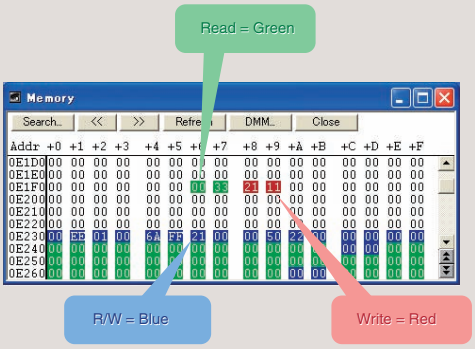
◆ Enhanced time measurement function

The time measurement function is used to measure the execution time taken by a program execution.
The following points were enhanced compared with the conventional high-performance emulator.
- New output items added: Total time only → Average, maximum, minimum, and pass count
- Number of channels: Expanded from 1 to 3 channels



◆ Enhanced real-time RAM monitoring functions

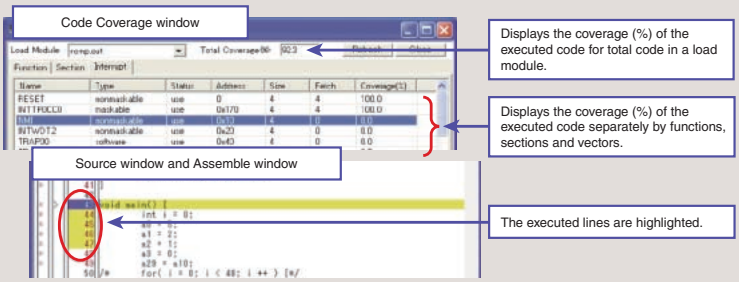
- Monitoring range expanded
  2 KB in internal RAM space → No limitations in entire space
- Enhanced display function when a change occurs in RAM
  RAM read/write operation by the microcontroller is highlighted with colors.
- High-speed operation
  Maximum operating frequency: 20 MHz



◆ Coverage measurement function

Measures the percentage of the executed code in a load module, section, or other such area.

- Measurement method: Execution coverage (other than execution count and access coverage)
- Measured range: Internal ROM space + external memory space

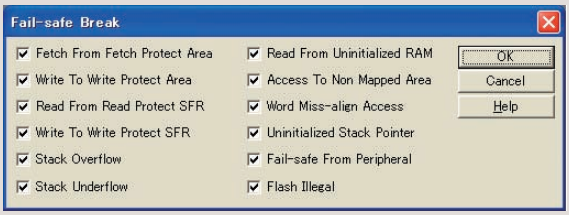

Code Coverage window
Displays the coverage (%) of the executed code for total code in a load module.
Displays the coverage (%) of the executed code separately by functions, sections and vectors.
Source window and Assemble window
The executed lines are highlighted.

◆ Function for emulating flash self-programming

Emulation for self-programming of the internal flash memory can be performed.
Errors can be generated intentionally in the flash macro service, and emulation when initial values are set to the security flag can be performed.

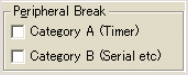
◆ Diverse fail-safe break functions

Detects and notifies program runaways caused by accessing of internal ROM, internal RAM, I/O registers, external memory, or the like, by setting a break.



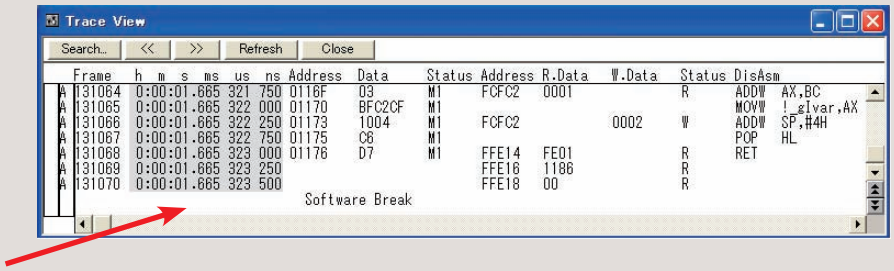
◆ Peripheral break function

The operation of peripheral functions, such as timers and UART during a break can be enabled or disabled.



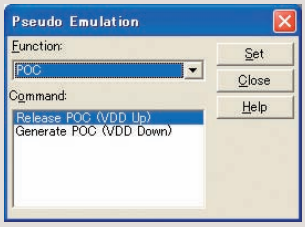
◆ Added time tag function in trace function

A function to record time in the Trace View window in instruction units has been added.



◆ Pseudo emulation function

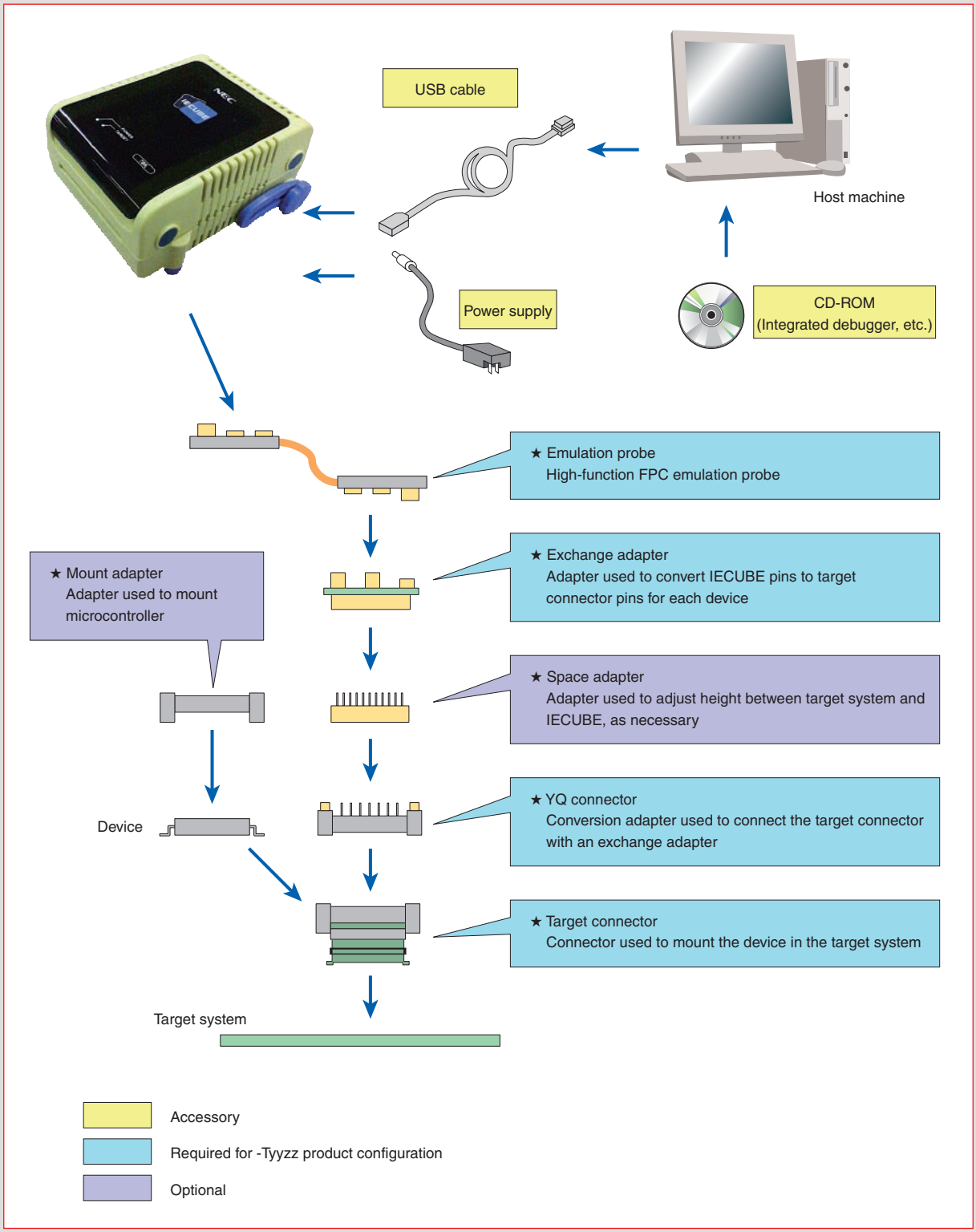
A function to verify programs by pseudo-generating POC, LVI, and TRAP functions during RUN has been added.



◆ Accessories

- Debugger (ID78K0R-QB), on-chip debug emulator with programming function (MINICUBE2), and documents included
- Sockets for emulation probe, exchange adapter, YQ connector, and target connector included (package that includes sockets)

System Configuration

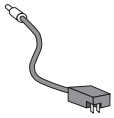

USB cable
Host machine
Power supply
CD-ROM
(Integrated debugger, etc.)
★ Emulation probe
High-function FPC emulation probe
★ Exchange adapter
Adapter used to convert IECUBE pins to target connector pins for each device
★ Mount adapter
Adapter used to mount microcontroller
★ Space adapter
Adapter used to adjust height between target system and IECUBE, as necessary
Device
★ YQ connector
Conversion adapter used to connect the target connector with an exchange adapter
★ Target connector
Connector used to mount the device in the target system
Target system
Accessory
Required for -Tyyzz product configuration
Optional

Configuration Example

QB-78K0RKX3-ZZZ configuration

IECUBE

USB cable

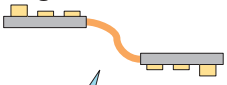

Power supply

CD-ROM

MINICUBE2

QB-78K0RKX3-Tyyzz configuration

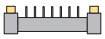
QB-78K0RKX3-ZZZ +


Emulation probe
QB-144-EP-02S

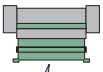
+

Exchange adapter
QB-yyzz-EA-0xT

+


YQ connector
QB-yyzz-YQ-0xT

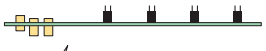
+


Target connector
QB-yyzz-NQ-0xT

Other options

Mount adapter
QB-yyzz-HQ-0xT

Space adapter
QB-yyzz-YS-0xT


Check pin adapter
QB-144-CA-01

Remark yy: Pin count
zz: Package

Refer to **Microcontroller Development Tools Selection Guide (U18459E)** (to be released) for development environment for devices when using IECUBE.

78K0 IECUBE

The following IECUBE series in-circuit emulators are supported by the 78K0.

QB-78K0KX1H:	78K0/KB1+, 78K0/KC1+, 78K0/KD1+, 78K0/KE1+, 78K0/KF1+, 78K0/KB1, 78K0/KC1, 78K0/KD1, 78K0/KE1, 78K0/KF1
QB-780714:	μPD78F071x microcontroller
QB-78K0KX2:	78K0/KB2, 78K0/KC2, 78K0/KD2, 78K0/KE2, 78K0/KF2
QB-78K0LX2:	78K0/LE2, 78K0/LF2, 78K0/LG2
QB-78K0FX2:	78K0/FC2, 78K0/FE2, 78K0/FF2
QB-780731:	μPD78F073x microcontroller
QB-78K0LX3:	78K0/LC3, 78K0/LD3, 78K0/LE3, 78K0/LF3
QB-179F124:	μPD179F11x, 179F12x microcontroller

Features

◆ Low price
- 1/8 to 1/10 price of existing high-performance emulator (IE-78K0-NS)
- Debugger (ID78K0-QB) and on-chip debug emulator with programming function (MINICUBE2) included

◆ Easy setup
- Combined in-circuit emulator and emulation board
- USB 2.0 interface supported (compatible with Hi-Speed USB I/F and USB 1.1)

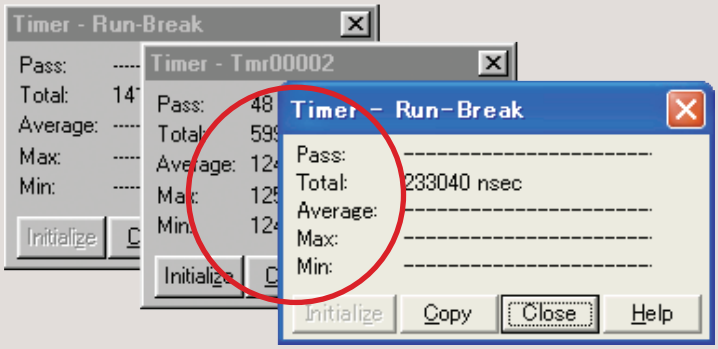
◆ Enhanced and added functions
- Functions equivalent to high-performance emulator
- Frequently-used functions enhanced, useful functions added

◆ Reinforced maintainability
- Self-diagnostic function mounted

◆ Compact and lightweight
- Palm-sized

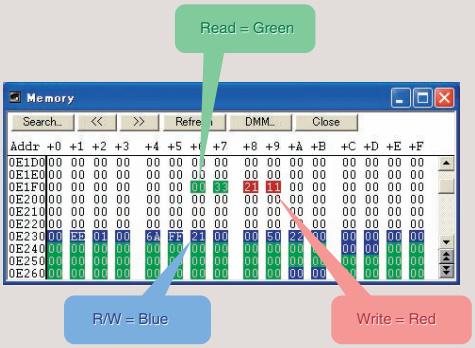
◆ Enhanced time measurement function

The time measurement function is used to measure the execution time taken by a program execution.
The following points were enhanced compared with the conventional high-performance emulator.
- New output items added: Total time only → Average, maximum, minimum, and pass count
- Number of channels: Expanded from 1 to 3 channels



◆ Enhanced real-time RAM monitoring functions

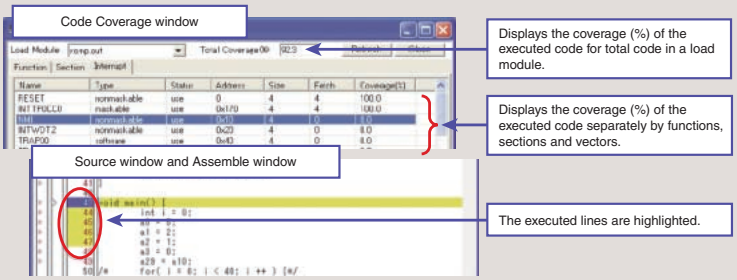
- Monitoring range expanded
  2 KB of entire space → No limitations in entire space
- Enhanced display function when a change occurs in RAM
  RAM read/write operation by the microcontroller is highlighted with colors.
- High-speed operation
  Maximum operating frequency: 20 MHz



◆ Coverage measurement function

Measures the percentage of the executed code in a load module, section, or other such area.

- Measurement method: Execution coverage (other than execution count and access coverage)
- Measured range: Internal ROM space + external memory space


Code Coverage window
Displays the coverage (%) of the executed code for total code in a load module.
Displays the coverage (%) of the executed code separately by functions, sections and vectors.
Source window and Assemble window
The executed lines are highlighted.

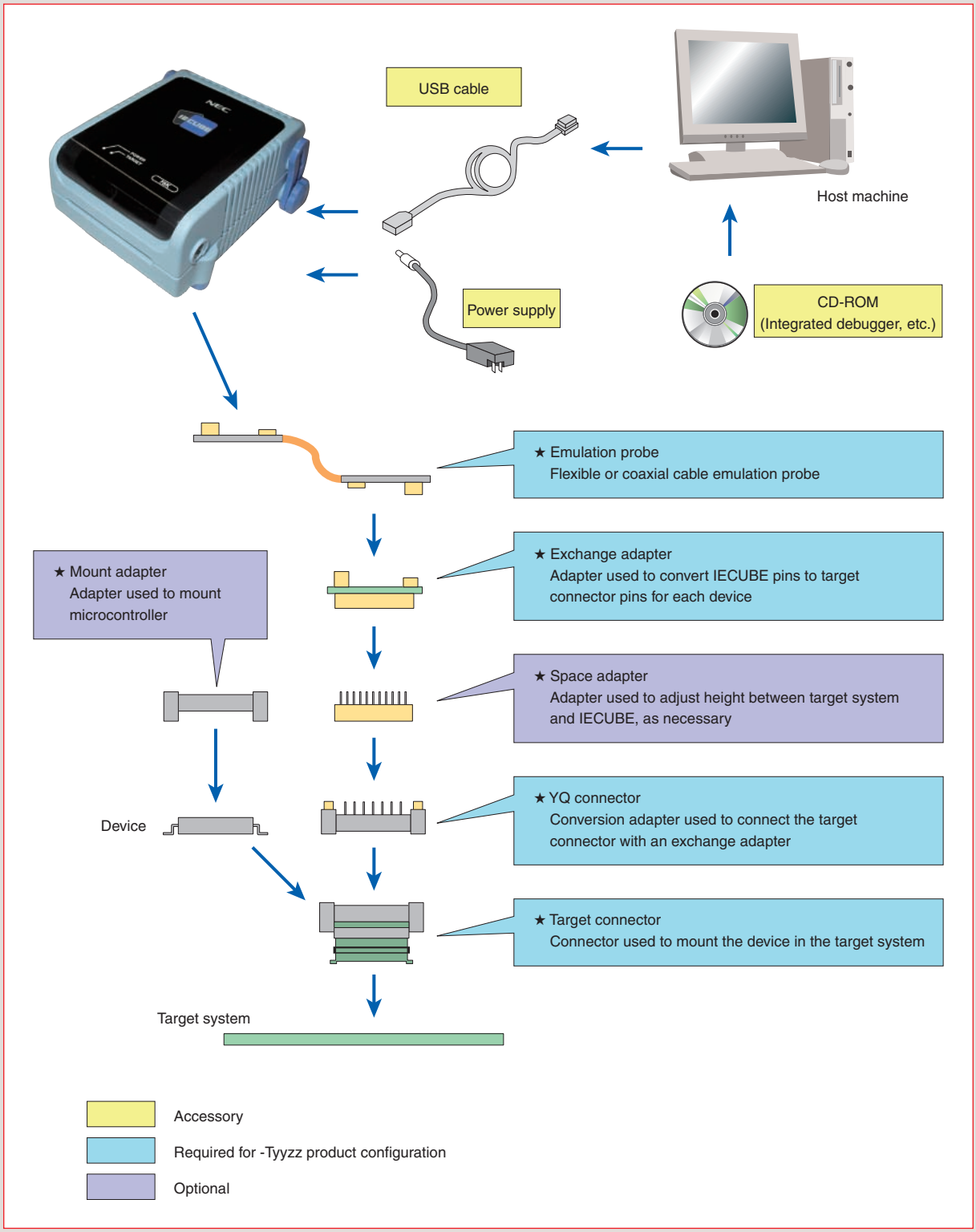
◆ Function for emulating flash self-programming

Emulation for self-programming of the internal flash memory can be performed.
Errors can be generated intentionally in the flash macro service, and emulation when initial values are set to the security flag can be performed.

◆ Accessories

- Debugger (ID78K0-QB), on-chip debug emulator with programming function (MINICUBE2), and documents included
- Sockets for emulation probe, exchange adapter, YQ connector, and target connector included (package that includes sockets)

System Configuration

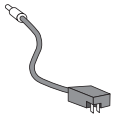

USB cable
Host machine
Power supply
CD-ROM
(Integrated debugger, etc.)
★ Emulation probe
Flexible or coaxial cable emulation probe
★ Exchange adapter
Adapter used to convert IECUBE pins to target connector pins for each device
★ Mount adapter
Adapter used to mount microcontroller
★ Space adapter
Adapter used to adjust height between target system and IECUBE, as necessary
Device
★ YQ connector
Conversion adapter used to connect the target connector with an exchange adapter
★ Target connector
Connector used to mount the device in the target system
Target system
Accessory
Required for -Tyyzz product configuration
Optional

Configuration Example

QB-78K0KX2-ZZZ configuration

IECUBE

USB cable


Power supply

CD-ROM

MINICUBE2

QB-78K0KX2-Tyyzz configuration

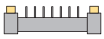
QB-78K0KX2-ZZZ +

Emulation probe
QB-80-EP-0xT

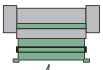
+

Exchange adapter
QB-yyzz-EA-0xT

+


YQ connector
QB-yyzz-YQ-0xT

+


Target connector
QB-yyzz-NQ-0xT

Other options

Mount adapter
QB-yyzz-HQ-01T

Space adapter
QB-yyzz-YS-01T

Check pin adapter
QB-144-CA-01

Remark yy: Pin count
zz: Package

Refer to **Microcontroller Development Tools Selection Guide (U18459E)** (to be released) for development environment for devices when using IECUBE.

78K0S IECUBE

The following IECUBE series in-circuit emulator is supported by the 78K0S.

QB-78K0SKX1: 78K0S/KA1+, 78K0S/KB1+, 78K0S/KU1+, 78K0S/KY1+

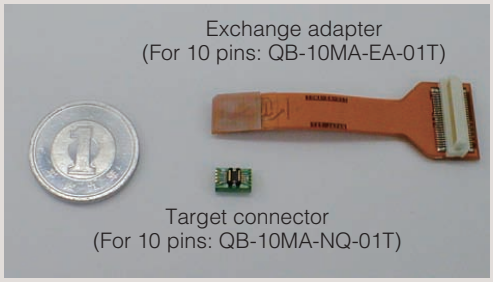
Features

◆ Ultra-low price
- Ultra-low price of less than 1/20 of conventional emulator (IE-78K0S-NS (-A)) and is the same as MINICUBE+
- Debugger (ID78K0S-QB) and on-chip debug emulator with programming function (MINICUBE2) included

◆ Easy setup
- Integration of MINICUBE+ MINICUBE and OCD adapter
- USB 2.0 interface supported (compatible with High-Speed USB I/F and USB 1.1)

◆ Enhanced and added functions

Functions added to MINICUBE+
- Functions equivalent to high-performance emulator (trace function)
- Useful functions (time measurement function) added
- Debugging of target device on foot pattern using compact target connector



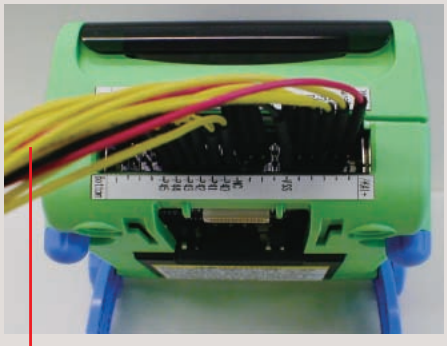
◆ Compact and lightweight
- Palm-sized

◆ Flash self emulation function

Rewriting by self programming of internal flash memory can be emulated.

◆ Connection with conventional MINICUBE+ target system

Connection with target system using target cable (single wire) inherited
- Recommended target pin header
  Specifications: 0.635 mm (L), 0.635 mm (W) (6 mm (H))



◆ RAM monitoring function
- Memory R/W possible during program execution

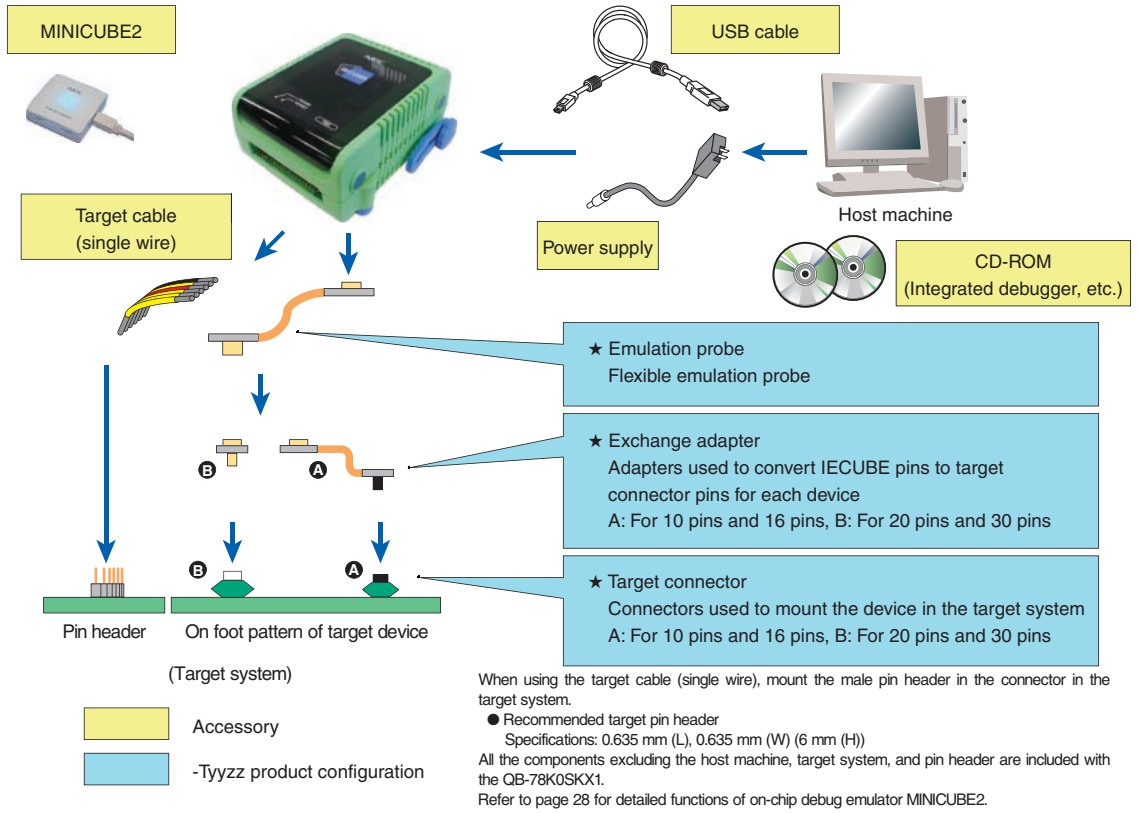
◆ Stack pointer initialization detection function

Uninitialized stack pointer can be detected as an error.

◆ Basic functions
- Event detection (access break: 1)
- Software break (break before execution: 2000 points)

◆ Accessories
- Debugger (ID78K0S-QB), on-chip debug emulator with programming function (MINICUBE2), target cables (single wire), and documents included
- Sockets for emulation probe, exchange adapter, and target connector included (package that includes sockets)

System Configuration


MINICUBE2
USB cable
Target cable
(single wire)
Power supply
Host machine
CD-ROM
(Integrated debugger, etc.)
★ Emulation probe
Flexible emulation probe
★ Exchange adapter
Adapters used to convert IECUBE pins to target connector pins for each device
A: For 10 pins and 16 pins, B: For 20 pins and 30 pins
★ Target connector
Connectors used to mount the device in the target system
A: For 10 pins and 16 pins, B: For 20 pins and 30 pins
Pin header
On foot pattern of target device
(Target system)
Accessory
-Tyyzz product configuration

When using the target cable (single wire), mount the male pin header in the connector in the target system.

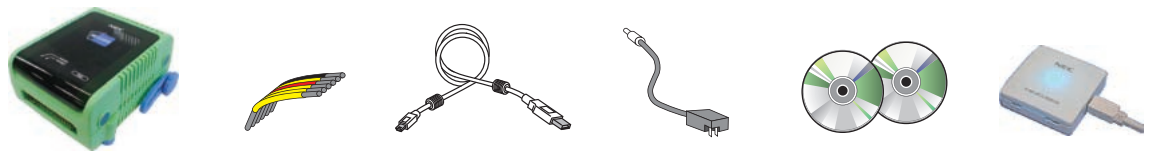
- Recommended target pin header
  Specifications: 0.635 mm (L), 0.635 mm (W) (6 mm (H))

All the components excluding the host machine, target system, and pin header are included with the QB-78K0SKX1.

Refer to page 28 for detailed functions of on-chip debug emulator MINICUBE2.

Configuration Example

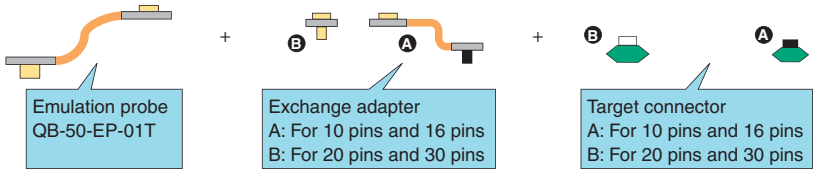
QB-78K0SKX1-ZZZ configuration



IECUBE | Target cable (30 single wires) | USB cable | Power supply | CD-ROM | MINICUBE2

QB-78K0SKX1-Tyyzz configuration

QB-78K0SKX1-ZZZ configuration +



Remark yy: Pin count
zz: Package
Refer to Microcontroller Development Tools Selection Guide (U18459E) (to be released) for the development environment for devices when using IECUBE.

MINICUBE2

The following products are available as on-chip debug emulator "MINICUBE2" for 78K microcontrollers.

QB-MINI2 (Alias: MINICUBE2)	■ On-chip debugging and flash programming supported 78K0 microcontrollers: 78K0/Kx2, 78K0/Lx2, 78K0/Lx3, μPD179F11x, μPD179F12x 78K0S microcontrollers: 78K0S/Kx1+ 78K0R microcontrollers: 78K0R/Kx3 ■ Only flash programming supported 78K0 microcontrollers: 78K0/Kx1+, 78K0/Fx2, μPD78F073x, 78K0/Kxx with LIN, μPD78F071x, μPD78086x 78K0S microcontrollers: μPD78F9334

Note As of March, 2008. Supported devices will be added as needed.
Only 78K microcontrollers supporting MINICUBE2 are listed above. When considering to develop a V850 microcontroller using MINICUBE2, refer to page 57 (MINICUBE2 for V850 microcontrollers).

On-chip debug emulator with programming function
"MINICUBE2"

MINICUBE2

Changing of center LED color according to operation status

Features

◆ On-chip debugging and flash programming
A debug function enabling the detection of bugs in a program to be integrated into a microcontroller, and a programming function to write a developed program to the microcontroller are mounted to cover the processes from debugging through mass production.

◆ Low-price
Further reduction of initial costs for development or mass production can be achieved because of its low price, 1/3 of the existing model MINICUBE.

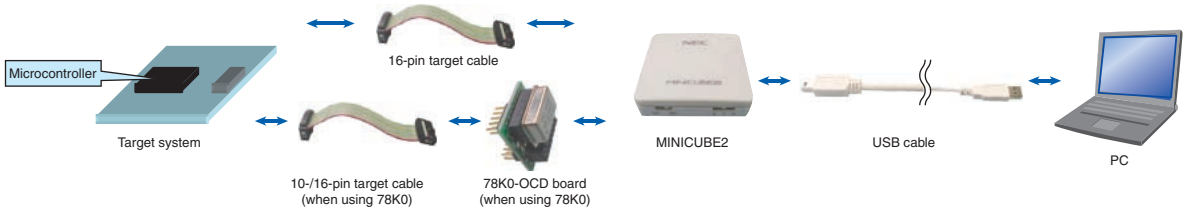
◆ 8-bit to 32-bit support
Cost reduction through the diversion of development environments and sharing of mass production systems can be achieved due to MINICUBE2 capability to cover the processes from development through mass production for various microcontrollers of different specifications.

◆ Single power supply flash memory product support
The support of all single power supply flash memory products to be released is planned, enabling continued use in the future.

◆ Compact, lightweight, and strap attachable
Saving of space in development and mass production and high portability can be achieved thanks to its compact size (48 × 48 × 12.4 mm) which is 1/4 in volume of the existing model MINICUBE and lightweight.

MINICUBE2 System Configuration

On-chip debugging and flash programming can be performed using a simple system configuration.

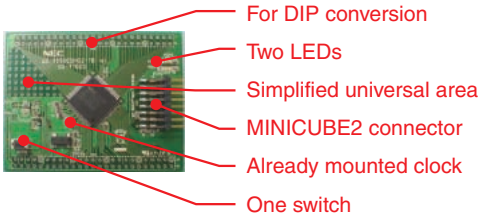


MINICUBE2 Option Products

A wide variety of option products is available.

★Trial CPU board

Recommended for users wishing to operate the microcontroller right away.



Quick Start Guide

The quick start guide on the NEC Electronics Web site can be used to try out the line of microcontroller development.

★Unbundled cable

Connection with MINICUBE2 can be established by simply mounting a test pin in the target system.
(This is a product of Naito Densei Machida Mfg. Co., Ltd.)

★SICA cable

Space of the connector mount area on the target system can be saved.
(This is a product of Tokyo Eletech Corporation.)

Differences with “78K0 MINICUBE”

The main differences with the conventional 78K0 MINICUBE are shown below.
Refer to the function list on the next page for detailed differences in functions required for debugging each 78K microcontroller.

MINICUBE

What’s different?

MINICUBE2

■ Low price
About 1/3 of conventional models

■ Compact and lightweight
About 1/4 in volume and 1/3 in weight

■ 8-bit to 32-bit microcontroller support
78K0S, 78K0R, and V850 microcontrollers supported besides 78K0 microcontrollers

■ Flash memory programming
Single power supply products (78K0, 78K0S, 78K0R, and V850 microcontrollers) supported

78K0 IECUBE, MINICUBE2, SM+ Function Comparison

		In-Circuit Emulator	On-Chip Debug Emulator	System Simulator
		QB-78K0XXX (IECUBE)	QB-MINI2 (MINICUBE2)	SM+
Maximum operating frequency		Equivalent to target device		Same frequency as target device is settable. Actual operating frequency depends on PC, program, or debug function used.
Emulation memory capacity	Internal ROM	64 KB (128 KB for bank products)	Internal ROM capacity of target device	64 KB (128 KB for bank products)
	Internal RAM	6 KB	Internal RAM capacity of target device	6 KB
	External memory	—	—	—
Event function	Execution events	8 points	1 point[Note 1]	64 points when shared between execution and access events
	Access events	Byte: 8 points, word: 2 points	1 point	
	Event link	1 point (up to 4-stage sequence possible)	—	16 points (up to 4-stage sequence possible)
Break function	Hardware break	34 points	2 points	64 points
	Software break	2000 points		Not available
	Forcible break	Enabled		Enabled
	Step execution	Enabled		
	Fail-safe break	Enabled	Only uninitialized stack pointer function	Enabled
Trace function	Trace memory capacity	128 K frames	None	Settable with 0 to 16 M frames (4 K frames by default)
	Trace items	All instructions (address/data), accessing (address/data), time stamps		All instructions (address/data), accessing (address/data), time stamps
Time measurement function	Program execution (start – end) measurement	Enabled		
	Inter-event measurement	Enabled (2 measurements)	Not available	Enabled (8 measurements)
	Display items of inter-event measurement results	Total value, pass count, maximum value, minimum value, average value		Total value, pass count, maximum value, minimum value, average value
	Timeout break	Enabled		Not available
Real-time RAM monitor function		Entire RAM area	Not available[Note 2]	Entire RAM area
Coverage function (execution coverage)	Memory capacity	Entire ROM area	Not available	Entire ROM area
Mask function		TARGET RESET, INTERNAL RESET, WAIT, NMI	TARGET RESET, INTERNAL RESET	Not available
Flash memory programming function		Not available (MINICUBE2 included)	Available	—
Exclusive user memory space for on-chip debugging		—	Internal ROM: 270 to 526 bytes Internal RAM: 7 to 16 bytes	—
Exclusive function pin for on-chip debugging		—	X1, X2 or OCD1A, OCD1B	—
PC interface		USB2.0, USB1.1		—
Simulation function		—		Simulation of simple external components, such as buttons and LEDs, displaying of I/O signal waveforms, customizing of external components, etc.

Notes 1. Execution event functions cannot be used when a software break is used.

2. A pseudo RRM function which performs monitoring by momentarily stopping program execution is available. A range of up to 8 points per byte and 16 bytes in total can be set.

78K0S IECUBE, MINICUBE2, SM+ Function Comparison

		In-Circuit Emulator	On-Chip Debug Emulator	System Simulator
		QB-78K0SKX1 (IECUBE)	QB-MINI2 (MINICUBE2)	SM+
Maximum operating frequency		Equivalent to target device		Same frequency as target device is settable. Actual operating frequency depends on PC, program, or debug function used.
Emulation memory capacity	Internal ROM	Internal ROM capacity of target device		1 MB
	Internal RAM	Internal RAM capacity of target device		60 KB
	External memory	None		Unlimited
Event function	Execution events	Not available	Not available	64 points when shared between execution and access events
	Access events	1 point[Note 1]		
	Event link	Not available		16 points (up to 4-stage sequence possible)
Break function	Hardware break	1 point	Not available	64 points
	Software break	2000 points		None
	Forcible break	Enabled	Enabled[Note 2]	Enabled
	Step execution	Enabled		
	Fail-safe break	Only uninitialized stack pointer break	Disabled	Enabled
Trace function	Trace memory capacity	1 K frame	None	Settable with 0 to 16 M frames (4 K frames by default)
	Trace items	With branch instruction (data/address) and interpolation function		All instructions (address/data), accessing (address/data), time stamps
Time measurement function	Program execution (start – end) measurement	Enabled		
	Inter-event measurement	Not available		Enabled (8 measurements)
	Display items of inter-event measurement results			Total value, pass count, maximum value, minimum value, average value
	Timeout break			Not available
Real-time RAM monitor function		Not available[Note 3]	Not available	Entire RAM area
Coverage function (execution coverage)	Memory capacity	Not available	Not available	Entire area
Mask function		TARGET RESET, INTERNAL RESET	TARGET RESET	Not available
Flash memory programming function		Not available (MINICUBE2 included)	Available	—
Exclusive user memory space for on-chip debugging		—	Internal ROM: 308 bytes Internal RAM: 5 bytes	—
Exclusive function pin for on-chip debugging		—	INTP[Note 4], X1[Note 5], X2[Note 5], $\overline{\text{RESET}}$	—
PC interface		USB2.0, USB1.1		—
Simulation function		—		Simulation of simple external components, such as buttons and LEDs, displaying of I/O signal waveforms, customizing of external components, etc.

Notes 1. Condition for stopping user program execution

2. A forcible break cannot be performed when interrupts are disabled (DI) or if communication I/F (INTP) interrupts are masked.

3. A pseudo RRM function which performs monitoring by momentarily stopping program execution is available. A range of up to 8 points per byte and 16 bytes in total can be set.

4. The INTP pin differs depending on the target device (INTP3 or INTP1).

5. Debugging of the X1 and X2 pins and their sharing function can be performed after the program has been downloaded.

78K0R IECUBE, MINICUBE2, SM+ Function Comparison

		In-Circuit Emulator	On-Chip Debug Emulator	System Simulator
		QB-78K0RKX3 (IECUBE)	QB-MINI2 (MINICUBE2)	SM+
Maximum operating frequency		Equivalent to target device		Same frequency as target device is settable. Actual operating frequency depends on PC, program, or debug function used.
Emulation memory capacity	Internal ROM	512 KB	Internal ROM capacity of target device	960 KB
	Internal RAM	61.75 KB	Internal RAM capacity of target device	60 KB
	External memory	None	None	Unlimited
Event function	Execution events	8 points	1 point when shared between execution and access events	64 points when shared between execution and access events
	Access events	8 points		
	Event link	2 points (up to 4-stage sequence possible)	None	16 points (up to 4-stage sequence possible)
Break function	Hardware break	20 to 24 points[Note 1]	1 point	64 points
	Software break	2000 points	2000 points	None
	Forcible break	Enabled		Enabled
	Step execution	Enabled		
	Fail-safe break	Enabled	Disabled	Enabled
Trace function	Trace memory capacity	128 K frames	None	Settable with 0 to 16 M frames (4 K frames by default)
	Trace items	All instructions (address/data), accessing (address/data), time stamps		All instructions (address/data), accessing (address/data), time stamps
Time measurement function	Program execution (start – end) measurement	Enabled		
	Inter-event measurement	Enabled (2 measurements)	Not available	Enabled (8 measurements)
	Display items of inter-event measurement results	Total value, pass count, maximum value, minimum value, average value		Total value, pass count, maximum value, minimum value, average value
	Timeout break	Enabled		Not available
Real-time RAM monitor function		PC/internal RAM area[Note 2]	Not available[Note 3]	Entire RAM area
Coverage function (execution coverage)	Memory capacity	Entire ROM area + external memory area	Not available	Entire area
Mask function		WAIT, TARGET RESET, INTERNAL RESET, NMI	TARGET RESET, INTERNAL RESET	Not available
Flash memory programming function		Not available (MINICUBE2 included)	Available	—
Exclusive user memory space for on-chip debugging		—	Internal ROM: 1047 bytes or 111 bytes[Note 4] Internal RAM: 6 bytes	—
Exclusive function pin for on-chip debugging		—	1-wire mode: TOOL0 2-wire mode: TOOL0, TOOL1	—
PC interface		USB2.0, USB1.1		—
Simulation function		—		Simulation of simple external components, such as buttons and LEDs, displaying of I/O signal waveforms, customizing of external components, etc.

Notes 1. Including 8 post-execution break points, 8 access break points, and 4 to 8 pre-execution break points. The number of pre-execution breaks varies depending on where they are set.

2. A pseudo RRM function which performs monitoring by momentarily stopping program execution can be used for all memory areas excluding the target memory and outside the range within which real-time RAM monitoring is enabled.

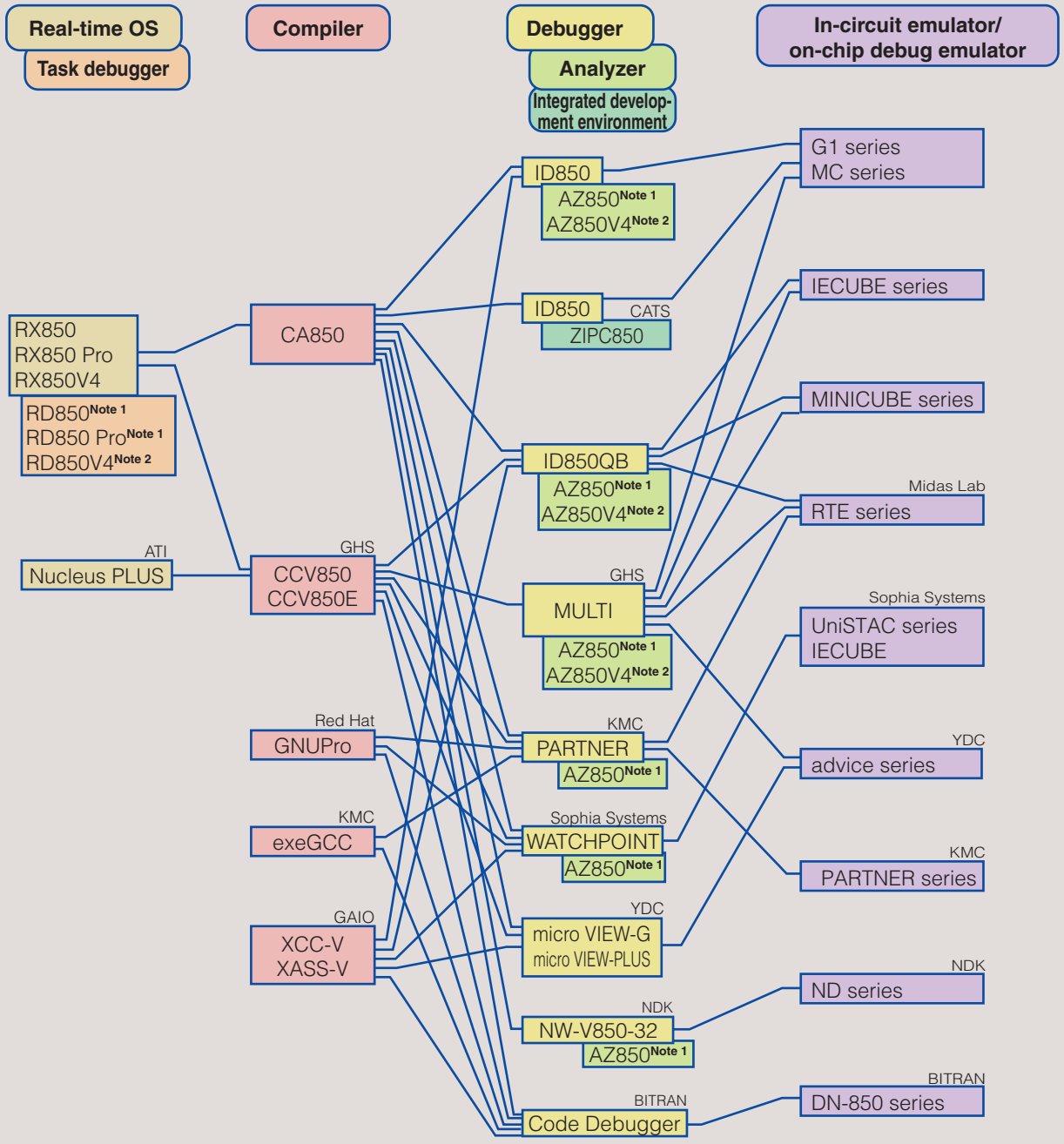
3. A pseudo RRM function which performs monitoring by momentarily stopping program execution is available. A range of up to 8 points per byte and 16 bytes in total can be set.

4. When the pseudo RRM function is not used in 2-wire mode, 111 bytes are occupied.

MEMO

V850 MICROCONTROLLER DEVELOPMENT ENVIRONMENT (1/2)

In-Circuit Emulator and On-Chip Debug Emulator Environment

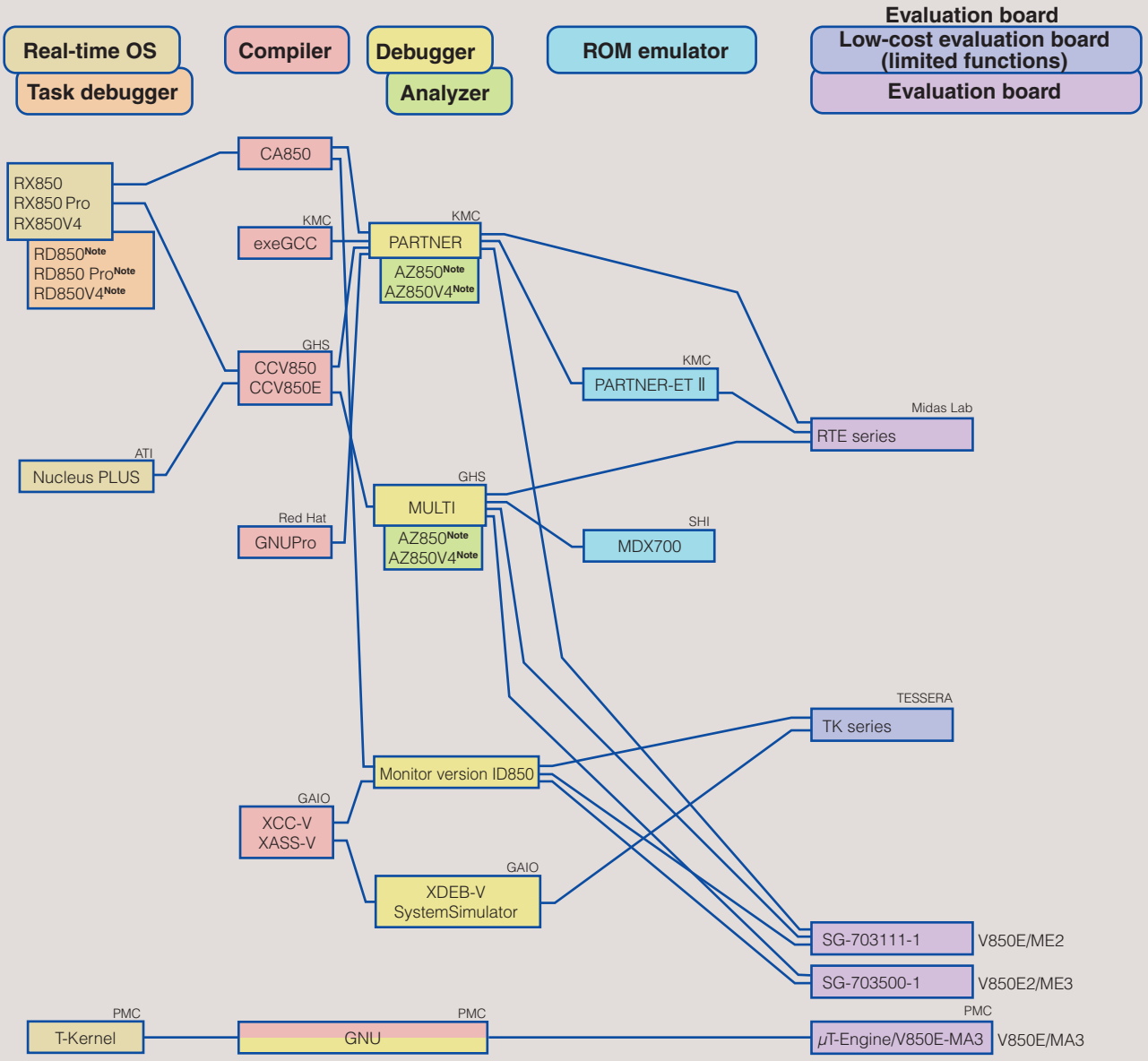


Notes 1. RD850, RD850 Pro, RD850V4, AZ850, and AZ850V4 can be used with ID850, ID850QB, MULTI, PARTNER, WATCHPOINT, and NW-V850-32.
2. RD850V4, and AZ850V4 can be used with ID850, ID850QB, and MULTI.

ATI:	Accelerated Technology, Inc.	Midas Lab:	Midas Lab Co., Ltd.
BITRAN:	BITRAN CORPORATION	NDK:	Naito Densei Machida Mfg. Co., Ltd.
CATS:	CATS, Inc.	Red Hat:	Red Hat, Inc.
GAIO:	GAIO TECHNOLOGY CO., LTD.	Sophia Systems:	Sophia Systems Co., Ltd.
GHS:	Green Hills Software, Inc.	YDC:	Yokogawa Digital Computer Corporation
KMC:	Kyoto Microcomputer Co., Ltd.	Others:	NEC Electronics Corporation

V850 MICROCONTROLLER DEVELOPMENT ENVIRONMENT (2/2)

ROM Emulator and Evaluation Board Environment



Note RD850, RD850 Pro, RD850V4, AZ850, and AZ850V4 can be used with MULTI and PARTNER.

ATI:	Accelerated Technology, Inc.	Midas Lab:	Midas Lab Co., Ltd.
Red Hat:	Red Hat,Inc.	SHI:	Sumitomo Heavy Industries Mechatronics, Ltd.
GAIO:	GAIO TECHNOLOGY CO., LTD.	TESSERA:	TESSERA Technology INC.
GHS:	Green Hills Software, Inc.	PMC:	Personal Media Corporation
KMC:	Kyoto Microcomputer Co., Ltd.	Others:	NEC Electronics Corporation

SOFTWARE PACKAGE

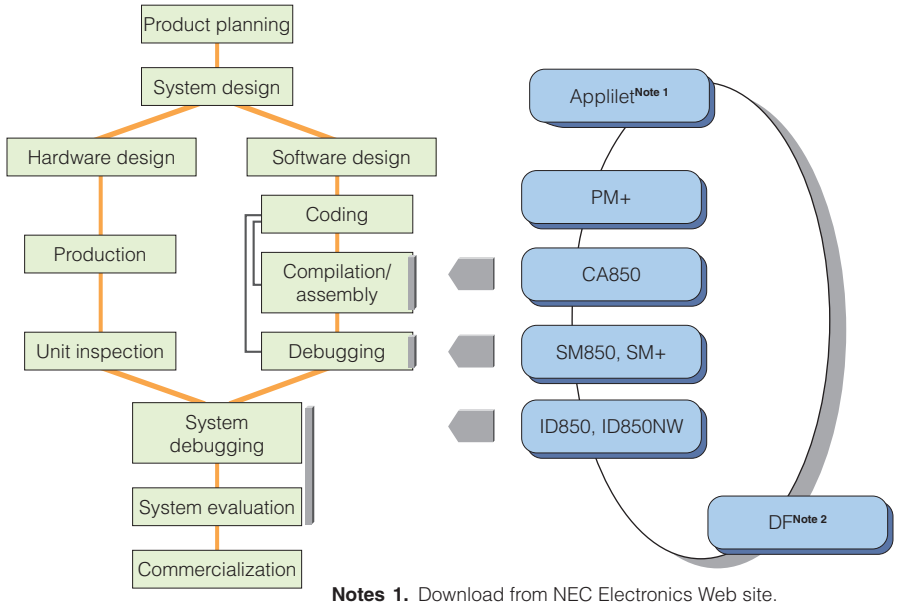
The SP850 software package combines various V850 microcontroller development tools and software products previously sold individually.

Package Contents

- C compiler package (CA850)
- Project manager (PM+)
- Integrated debugger (ID850, ID850NW)
- System simulator (SM850, SM+ for V850)

Features

- Integrated development environment from language tools to debugger and analysis tools
- Simple installation using integrated installer
- Enhanced linking functions for development tools and software products
- Optimized object debugging with compiler
- High-speed simulation of peripheral function operation (excluding some devices)
- Management of different versions of the same tool
- Sample program for development tool operation verification (with user's manual) included
- Timely version upgrade via development tools download service as well as version upgrade via supply media



Notes 1. Download from NEC Electronics Web site.
2. Download from development tools download service.

C COMPILER

The following compiler is supported with V850 microcontrollers.

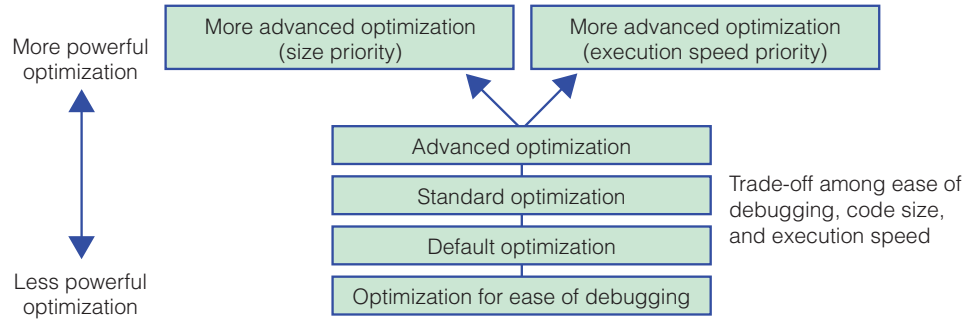
CA850: C compiler package for V850 microcontrollers

Features

- ◆ Complies with ANSI-C standard for C language programming
- ◆ Includes powerful optimization functions
- ◆ Provides functions optimized for embedded systems
- ◆ Provides multiple utilities

Powerful Optimization Functions

The CA850 comes with "powerful optimization functions" that make the most of the device's performance features. Users can select among six optimization levels, and can even set optimization levels for individual sources.


More powerful optimization
Less powerful optimization
More advanced optimization (size priority)
More advanced optimization (execution speed priority)
Advanced optimization
Standard optimization
Default optimization
Optimization for ease of debugging
Trade-off among ease of debugging, code size, and execution speed

Functions Optimized for Embedded Systems

The CA850 provides functions optimized for development of the embedded systems.

○ Functions related to size reduction of ROM/RAM used and acceleration of execution speed

- ◆ Selection of register mode (software register bank function)
  - → Setting a limit on the number of registers that can be used by the compiler (either 22 or 26 registers) reduces the interrupt overhead (saving to and restoring from registers).
- ◆ Run-time library is used for processing of function prologues and epilogues
  - → Code size is reduced by library functions that can be called both when saving to registers and when restoring from registers (slightly accelerates execution speed).
- ◆ Structure/union packing function
  - → This packing function fills holes between members of structures or unions due to alignment, which reduces code size (slightly accelerates execution speed).
- ◆ Register allocation function for external variables
  - → When in 22 or 26 register mode, the user can freely allocate external variables to any usable register and can change the memory access to the register access. This can shrink the code size while accelerating execution speed.

Caution The CA850 does not support double-precision floating points.
Refer to the CA850 User's Manual for details.

○ **Functions implemented via C language descriptions**

- ◆ Data and variables can be allocated to specified memory areas.
  → Enables allocation of data and/or variables to memory areas that can be accessed at high speed
- ◆ Interrupt/exception handler processing can be coded in C language.
  → Register save/restore processing required in assembly code can be performed automatically by compiler
- ◆ Assembly code instructions can be inserted into C language source code.
  → Useful for partial, high-speed processing, etc.
- ◆ Access to peripheral I/O register can be handled as ordinary variable access.
  → Uses "device files" that contain definitions of peripheral I/O register names, interrupt request names, on-chip memory size, and other information
- ◆ Real-time OS (RX850, RX850 Pro, RX850V4) tasks can be coded
  → Reduces code not required for tasks

Accessory Utilities

The CA850 provides various utilities that can be used for development of embedded systems.

○ **ROMization processor (romp850)**

The initial values of variables must be set before running any applications when they are declared with initial values. The romp850 utility generates these initial values and the information to be copied. This ROMization processor's functions can also be used to generate information to be copied when ROM code is deployed to RAM before executing.

○ **HEX converter (hx850)**

This utility converts executable object files to a hexadecimal format. The following hexadecimal formats are supported.

- ◆ Intel expanded hex format
- ◆ Motorola S type format (standard address)
- ◆ Motorola S type format (32-bit address)
- ◆ Extended Tek hex format

○ **Section file generator (sf850)**

This utility allocates frequently used variables (among all variables used by an application) to an internal RAM area.

○ **Dump command (dump850)**

The dump command displays the contents of a specified object file or archive file in an easy-to-read format.

○ **Disassembler (dis850)**

This utility converts text-attribute data (program code) from object files or archive files into assembly language and displays the assembly language code.

○ **Cross reference tool (cxref)**

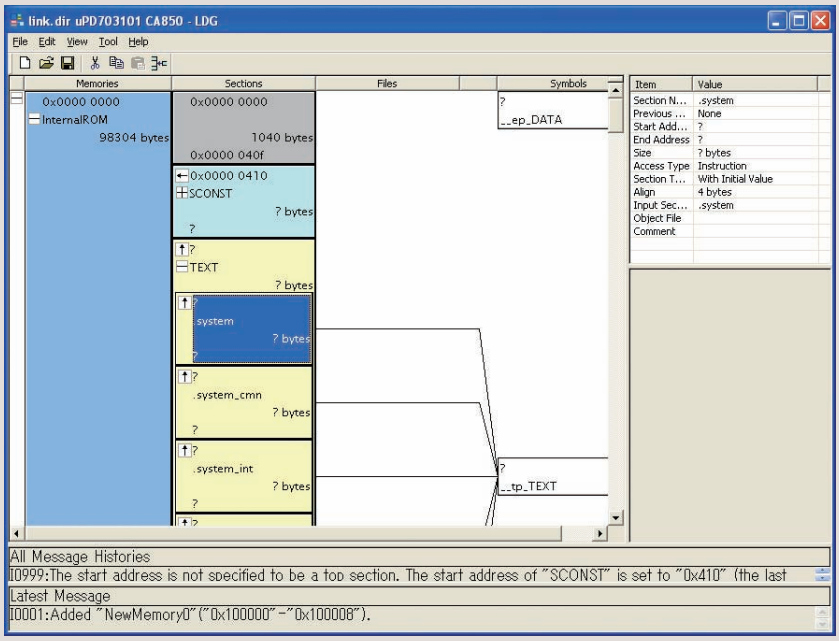
This utility outputs cross reference information, tag information, call tree information, function metrics (number of lines in function, function's call frequency, etc.), and call data base (function call information).

○ **Memory layout visualization tool (rammap)**

This utility displays a visualization of variable allocation information.

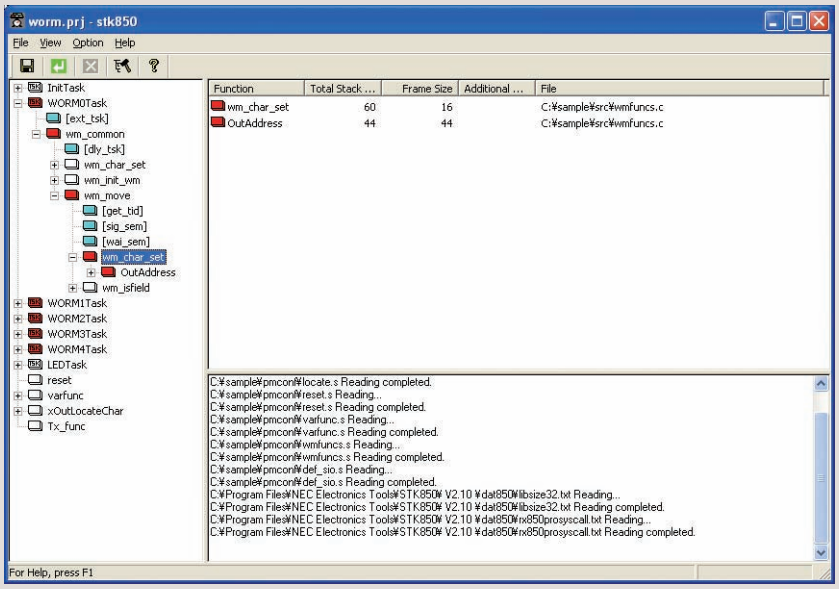
○ **Link directive generator (LDG)**

This utility can be used to generate (via the GUI) "link directive files" that specify the section allocation order, addresses, etc.



○ **Stack usage tracer (stk850)**

This utility statically estimates the stack size used by sets of functions within a project. Estimations can also be performed as the real-time OS task (RX850, RX850 Pro, RX850V4).

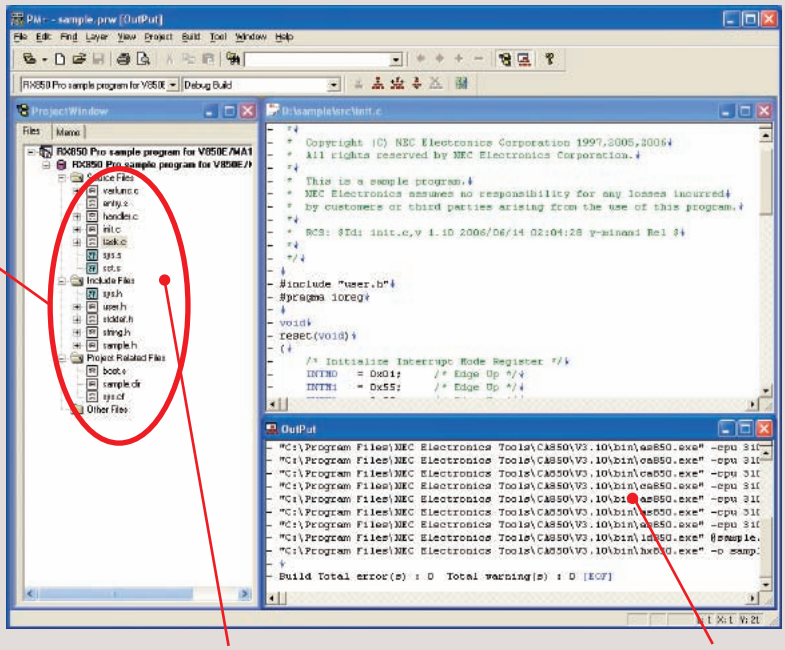


PROJECT MANAGER (PM+)

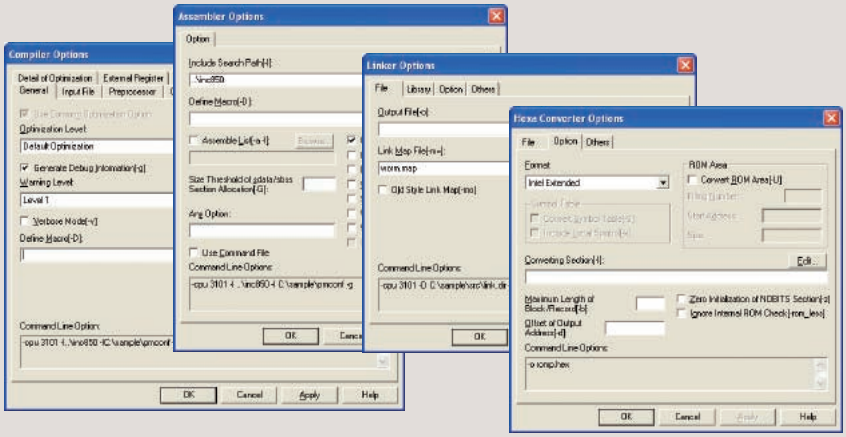
The project manager enables more efficient development by integrating tools such as a C compiler and debugger.

Features

- ◆ Enables editing, build, and debugging, as a series of operations
- ◆ Includes an editor function
  Includes a smart look-up function that provides a short-cut for coding function names and task names
- ◆ Menus and tool bars can be customized

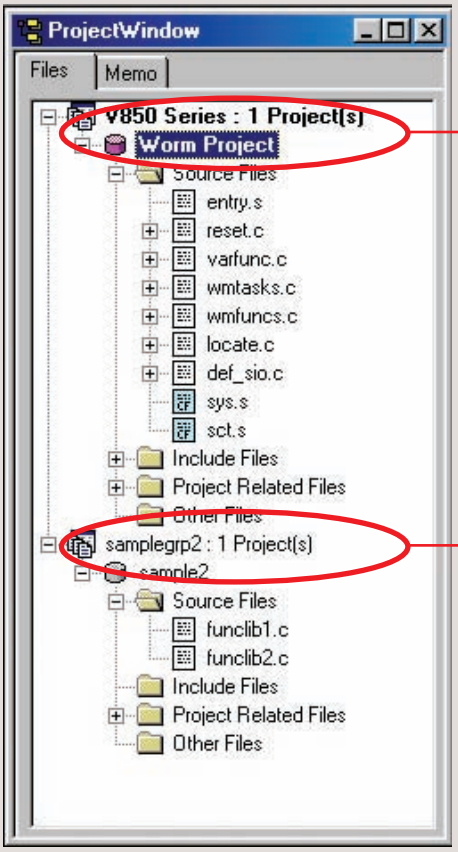

Source file group
Click function name or task name from source file to jump to corresponding location in source code
Build execution progress display

- ◆ Tool options can be specified via dialog boxes



◆ Facilitates project management

Enables management of source code and documents as well as version management using CVS. Multiple projects can be managed in the same work space.



This is the "main project."

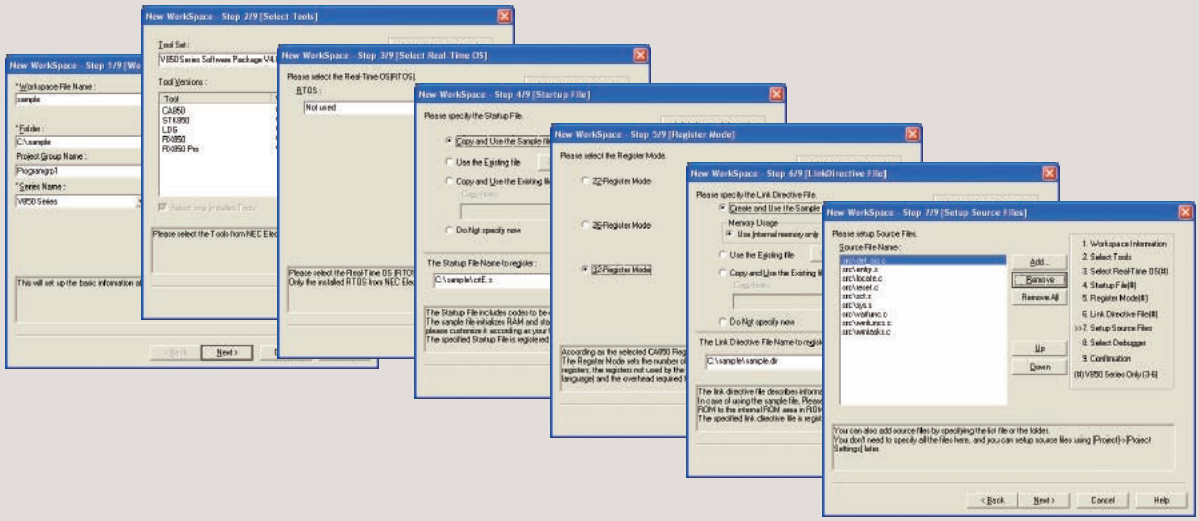
This is the "library creation project."

This kind of management is enabled.

Includes a "batch build" function that builds multiple projects as a single batch.

◆ Wizards can be used to create projects

Wizard screens provide an easier way to register target device names and required source files, to specify whether or not a real-time OS will be used, and to set startup routines or link directive files.



INTEGRATED DEBUGGERS

The following integrated debuggers are available.

ID850QB: C source debugger for V850 microcontrollers (supporting MINICUBE and IECUBE)
ID850: C source debugger for V850 microcontrollers (supporting MC series and G1 series)

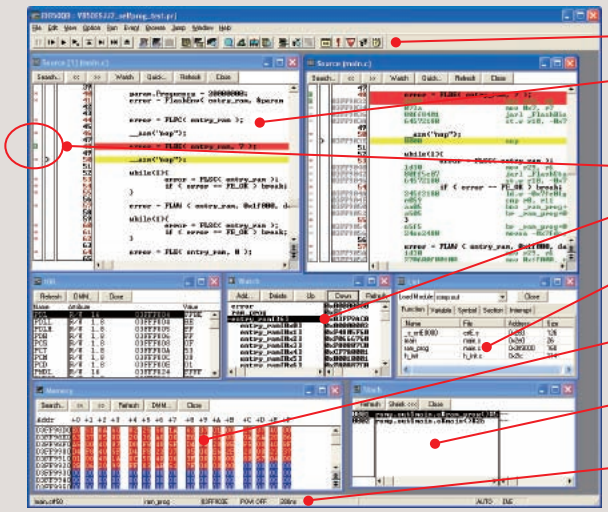
Features

◆ Source can be debugged.
Source program in C and assembly language can be debugged.

◆ Wealth of debug functions
By using the event functions of an in-circuit emulator (IE), break, trace, time measurement, and coverage measurement can be executed.
In addition, basic debugging such as break and run-break time measurement can be executed also for on-chip debugging (OCD) by using the event functions of the debug control unit (DCU).

◆ Function expansion by Tcl
Batch processing and hook processing on the command line and creating user's original custom windows can be performed by using Tcl/Tk (Tool Command Language).

◆ Function expansion by TIP or ToolLink
By using a task debugger (RD) and system performance analyzer (AZ) supporting TIP (Tool Interface Protocol) or ToolLink, debugging efficiency of a user program using a real-time OS (RX) can be dramatically enhanced.



Frequently used functions are registered on the tool bar.

Can debug at the C source level
Can perform a mixed display of the assembly language that corresponds to the C source

Can set break points by using a single button

Can immediately check the values of frequently seen variables by watch-registration

Can display function names, addresses, and sizes in a list

Memory window enabling the identification of read and write traces (when IECUBE is used)

Can check call functions and local variables in the stack frame information

The time from the start until stop of execution is displayed.

SYSTEM SIMULATORS

The following system simulators are available.

SM+ for V850ES/Sx2:	Instruction + peripheral simulator for V850ES/SG1, V850ES/SG2, V850ES/SJ2, V850ES/SG3 (planned to be supported), and V850ES/SJ3 (planned to be supported)
SM+ for V850ES/Fx2:	Instruction + peripheral simulator for V850ES/FE2, V850ES/FF2, V850ES/FG2, and V850ES/FJ2
SM+ for V850ES/Hx2:	Instruction + peripheral simulator for V850ES/HE2, V850ES/HF2, V850ES/HG2, and V850ES/HJ2
SM+ for V850ES/Jx2:	Instruction + peripheral simulator for V850ES/JG2 and V850ES/JJ2 (under development)
SM+ for V850ES/Kx2:	Instruction + peripheral simulator for V850ES/KE2, V850ES/KF2, V850ES/KG2, and V850ES/KJ2 (under development)
SM+ for V850ES/Fx3:	Instruction + peripheral simulator for V850ES/FE3, V850ES/FF3, V850ES/FG3, V850ES/FJ3, V850ES/FK3, V850ES/FE3-L, V850ES/FF3-L, V850ES/FG3-L
SM+ for V850:	Instruction simulator for V850E and V850ES
SM850:	Instruction + peripheral simulator for V853, V850/SA1, V850/SB1, V850/SB2, V850/SF1, V850E/MS1, V850E/MA1, V850E/IA1, V850E/IA2, V850ES/SA2, V850ES/SA3, V850ES/KF1, V850ES/KG1, V850ES/KJ1, V850/SC1, V850/SC2, V850/SC3

Instruction + peripheral simulators: **Can simulate instruction execution by the CPU and internal peripheral functions such as timers and UART. (The SM850 is included with the software package. Other simulators are sold separately.)**

Instruction simulators: **Can simulate only instruction execution by the CPU (included in the software package).**

Features

◆ Target-less evaluation

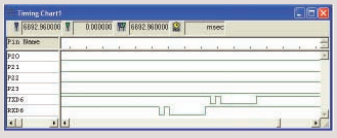
Microcontroller operations, including the operations of the on-chip peripheral units and interrupt servicing, in addition to the operation of the CPU, can be simulated.
Programs can be debugged in an early stage without an in-circuit emulator.

◆ Same operability as debuggers for V850 microcontrollers

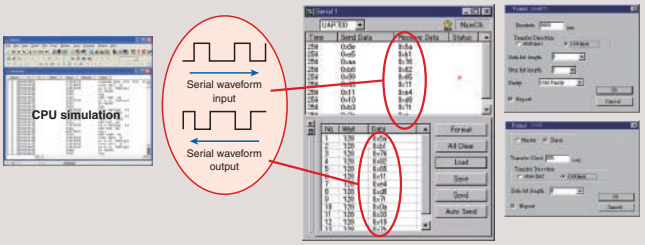
◆ Various simulation functions

- System debugging on PC (I/O panel window)
  Dummy target systems can be organized by placing buttons and LEDs.
  Panels having the same operability as Microsoft PowerPoint can be created.

- Monitoring I/O waveform of microcontroller (timing chart window)
  Waveforms can be monitored in an oscilloscope-like image.



- Simulation of serial transmission/reception (serial window)
  Transmits serial data to the microcontroller and displays reception of serial data from the microcontroller.



Remark All screen images are screenshots of the SM+. The functions of the SM850 vary slightly.

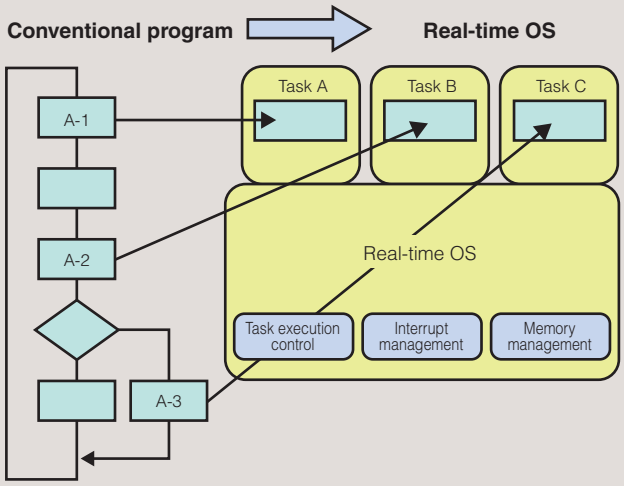
μITRON SPECIFICATION-COMPLIANT REAL-TIME OS

The following ITRON specification-compliant real-time OSs are supported by the V850 microcontrollers.

RX850: μITRON specification-compliant real-time OS for V850 microcontrollers (μITRON3, low memory load)
RX850 Pro: μITRON specification-compliant real-time OS for V850 microcontrollers (μITRON3, high function)
RX850V4: μITRON specification-compliant real-time OS for V850 microcontrollers (μITRON4)

Why is a real-time OS needed?

With the recent advances in the performance and functionality of microcontrollers, not only have the systems to be developed become more complex, but also the quantity of the programs to be executed by these systems has increased. Because systems in the field of control equipment in particular are required to respond immediately to changes in external and internal events, many problems that cannot be solved by conventional interrupt servicing have arisen; hence the development of the real-time OS.
The real-time OS is designed to react promptly to event changes and interrupts and manages multiple processing programs by dividing them into task units, which are then executed in the optimal order.



Real-time OS advantages

<For designing>
- ◆ Facilitates creation of application modules
- ◆ Software development can be focused solely on the application
- ◆ Management of program in task units
- ◆ Tasks can be set individually by prescribing an inter-task communication mode

<For debugging>
- ◆ Discrete task debugging enables multiple operators to debug simultaneously
- ◆ Only inter-task communication and synchronization testing are required for integrated debugging

<For program maintenance>
- ◆ Specification changes and function additions can be executed in task units, reducing the effect on the system as a whole
- ◆ Because the program consists of task units:
  - → The internal structure is simplified, resulting in greater program legibility
  - → The program can be reused in task units, even in other systems

The real-time OSs offer the following high-performance environment.

- ◆ Compliance with industry standards (μITRON specifications)
- ◆ Support for power management functions
- ◆ Capability to embed required functions only (selection of system calls to be used)
- ◆ Advanced task development support through task debugger (RD)
- ◆ Application operational analysis support through system performance analyzer (AZ)

		RX850	RX850 Pro	RX850V4
Specification		μITRON3.0	μITRON3.0	μITRON4.0
Target devices		V850, V850ES, V850E1	V850, V850ES, V850E1, V850E2	V850, V850ES, V850E1, V850E2
Supported device modes		22, 26, 32	32	22, 26, 32
Memory allocation		Partial restriction[Note 1]	No restriction	No restriction
Dynamic generation/ deletion of resources		—	√	—
Mutex		—	—	√
Data queue		—	—	√
1-bit event flag		√	—[Note 2]	—[Note 2]
Fixed-length memory pool		√	—[Note 3]	√
Task exception processing routine		—	—	√
CPU exception handler		—	—	√
Extended SVC		—[Note 4]	√	√
Idle state		Specified by user (idle handler)	Halt[Note 6]	Specified by user (idle routine)
Load module division		—	√	—
Stack check function		—	—	√
GUI configuration		—	—	√
Resource change from task debugger		—	—	√
Performance[Note 5]	Task switching time[Note 7]	11.0 μs	11.2 μs	16.0 μs
	Interrupt startup time	2.9 μs	4.8 μs	6.0 μs
Size[Note 8]		ROM: 5.7 KB RAM: 2.1 KB	ROM: 13.3 KB RAM: 3.2 KB	ROM: 11.5 KB RAM: 2.4 KB

Notes 1. The pool0 section and .sit section must be set as areas at address 0 ±32 KB.

2. The event flag can be used in substitution.

3. The variable-length memory pool can be used in substitution.

4. A function call can be used in substitution.

5. This performance is applicable under the following conditions.
Program: internal ROM, data/stack: internal RAM, frequency: 25 MHz

6. Any mode can be supported by creating an idle task by the user.

7. This is the time of waiting at “task switching time = wup_tsk” and then releasing.

8. Five tasks, two semaphores, three cycle handlers, one variable-length memory pool (memory pool size = 1024 bytes). Frequently used system calls are selected. This value excludes the user code and the stack size used by the user.

OSEK/VDX SPECIFICATION-COMPLIANT OS

The following OSEK/VDX specification-compliant OS is supported by the V850 microcontrollers.

RX-OSEK850: OSEK/VDX specification-compliant OS for V850 microcontrollers

Features

◆ Kernel

Compliant with the OSEK/VDX OS Ver. 2.2.3 specifications
Four conformance classes (BCC1, BCC2, ECC1, and ECC2) are supported

◆ Configurator

A configurator that simplifies the configuration of system information is provided as standard.
The configuration file supports a format compliant with OIL Ver. 2.5.

◆ Task debugger (RD-OSEK850)

An efficient task debugger for debugging applications that use the RX-OSEK850 is provided as standard.

◆ System performance analyzer (AZ-OSEK850)

System performance analyzer for RX-OSEK850 provided as standard

◆ Target devices

V850E1 core microcontrollers
V850ES core microcontrollers

TASK DEBUGGERS

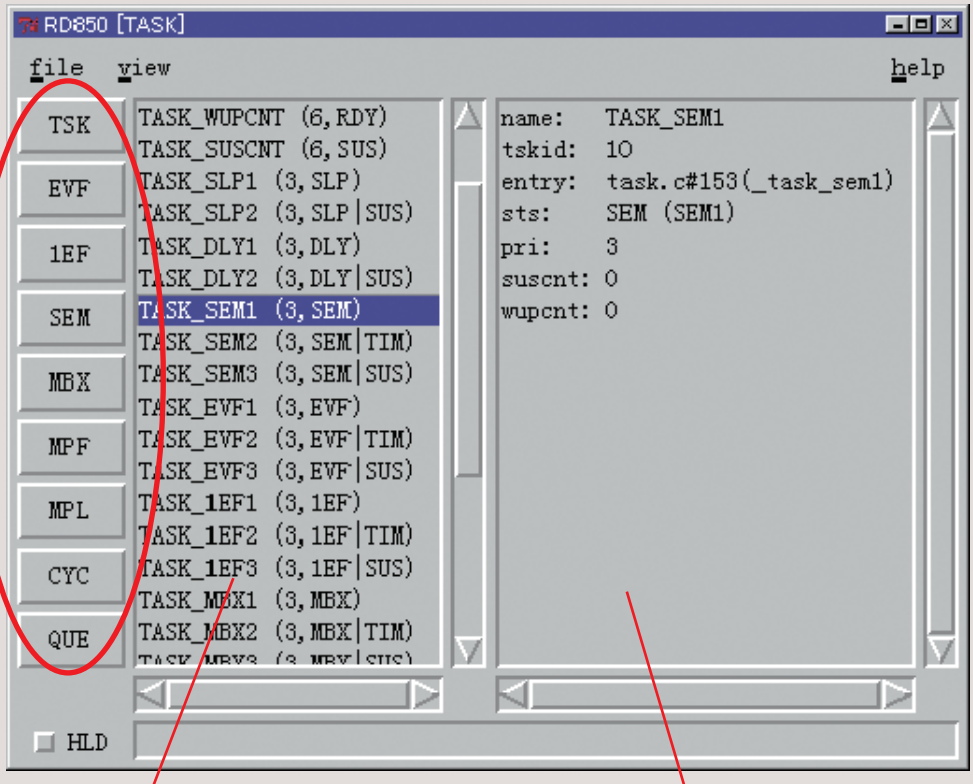
These debuggers provide the functions essential for debugging applications that employ a real-time OS.
The task debuggers are provided in the RX package as standard.
The main functions of the task debuggers are shown below.

- ◆ Detailed display of OS resources such as tasks
- ◆ Display of referenced task sources

The following table shows the supported tools and operating environment of each task debugger.

RD	Supported Tools		
	OS	Debugger	Simulator
RD850	RX850	ID850 ID850QB	SM850 SM+
RD850 Pro	RX850		
RD850V4	RX850V4		
RD-OSEK850	RX-OSEK850		

RTOS resource selection buttons



A list of resources selected using the buttons on the left is displayed.
The example above is the list appearing when the TSK button is clicked.

Details of the resource selected in the window on the left are displayed.

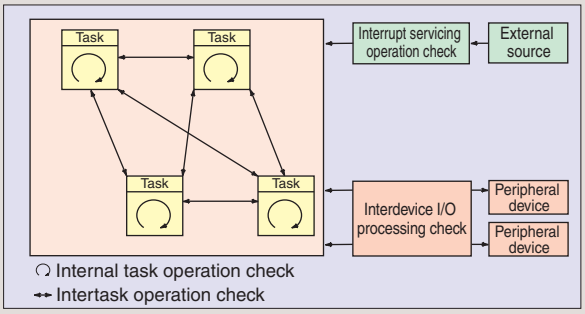
SYSTEM PERFORMANCE ANALYZER

The system performance analyzer visually displays records of executed tasks and RTOS resource access data, thereby clarifying the task load status and making it easy to determine the tuning index.
The system performance analyzer is provided in the RX package as standard.

Quantitative Evaluation Index

In a system constructed using a design → coding → debugging process, tuning work is necessary to optimize the CPU's performance and resources, and is used to assess the system performance and analyze its operation, through which system performance and product quality can be raised.
Tuning work usually involves checking the following operations and then analyzing the system's response performance.

Operation check



- Intertask operation check
  (Deadlock status, task run sequence, resource access status)
- Internal task operation check
  (System call/return value)
- Interrupt servicing operation check
  (Occurrence frequency, nesting depth, servicing time, enable/disable position)

Response Performance Analysis

- Adequacy of access division (task run time)
- Selection of optimal scheduling (task priority level)
- Optimal resource allocation (resource utilization efficiency, resource values)

Algorithms and the system configuration concept can be changed at the design stage, based on analysis results. The tool that supports this kind of analysis and modification is the system performance analyzer (AZ).

This performance analyzer, operated in combination with one of a variety of debuggers, has the following functions.

- Detection of bugs caused by system timing misses
- Detection of problems caused by the simultaneous operation of multiple tasks
- Verification/analysis of real-time system execution performance

The system performance analyzer displays trace data visually and provides the following functions for software operation control, thus facilitating task operation analysis.

- Detection of unnecessary system processing
- Support of source analysis
- Clarification of the system tuning index

The tools supported for this analyzer and their operating environments are shown in the table below.

AZ	Supported Tools		
	OS	Debugger	Simulator
AZ850	RX850 RX850 Pro	ID850[Note] ID850QB	SM850 SM+
AZ850V4	RX850V4		
AZ-OSEK850	RX-OSEK850		

Note Some functions can also be executed using a partner debugger.

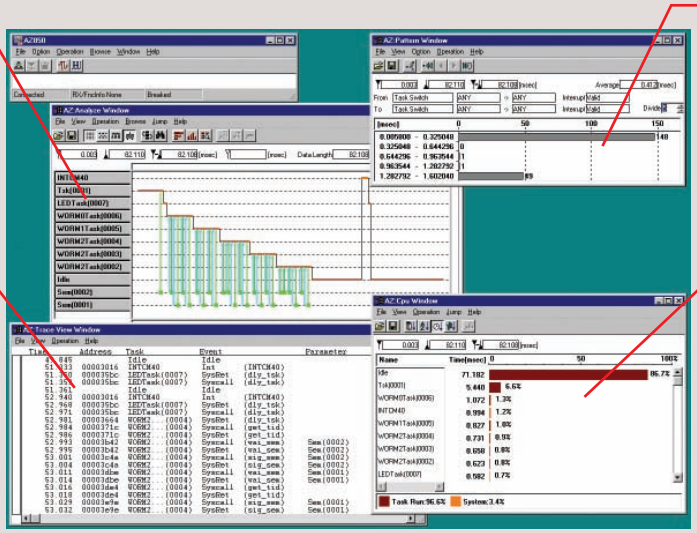
The performance analyzer consists of four windows:

Execution transition status display window

Processing time pattern distribution display window

Trace display window

CPU utilization rate display window



◆ Execution transition status display window

This window displays the object movement versus time relationship, with time indicated by the horizontal axis and object movement by the vertical axis. Analysis of system status changes caused by task switching or interrupts/exceptions, and object accesses based on real-time OS system calls are displayed as symbols, making it easy for the user to ascertain the sequence and transition of execution. These functions enable specification of the problems for the performance analysis.

◆ CPU utilization rate display window

This window can be used to confirm the object execution time and CPU utilization rate that guide users in the analysis of the system overhead and indicate execution performance, so that the system performance can be evaluated from the view point of the idle time and interrupt time.

◆ Processing time pattern distribution display window

Users can analyze the causes of scheduling problems by viewing the statistical breakdown of the execution processing time, as well as the interrupt frequency and execution time maximum/average/minimum figures displayed in this window.

◆ Trace display window

Trace data from the execution transition status can be viewed. This window can be used as a sub window of the execution transition status window so that timestamps of execution status transitions and values returned by system calls can be checked.

MIDDLEWARE

The following middleware is available.

RX-NET: V850E network library
RX-FS850: V850E file system
GOFAST: V850 high-speed floating point library

Features of RX-NET

◆ Complies with RFC

◆ Supports multi-socket interfaces

◆ Supports optional products such as PPP, FTP, Telnet, as well as TCP/IP basic set

◆ Device drivers provided
Various LAN controller drivers and serial control drivers are included in the source. Since the device driver section is separate from the RX-NET library, device drivers other than those included in the package can also be imported.

◆ Supports NEC Electronics real-time OS (RX850 Pro)

Features of RX-FS850

◆ Uses PC-compatible file system
- ○ Formats for hard disk drives
  - • FAT (FAT12, FAT16, or FAT32)
  - • Supports file names up to 254 characters long (VFAT)
- ○ Formats for CD-ROM drives
  - • ISO-9660 Level 1
  - • Joliet (supports file names up to 64 characters long)
  - • Supports multi-session CDs

◆ Designed for multi-tasking
- ○ No need to set up exclusive control between tasks when issuing API
- ○ Includes file locking function to prevent concurrent write operations from multiple tasks to the same file

◆ Complies with UNIX API

◆ Supports hot swap
- ○ Enables hot swap such as for PC cards

◆ Auto buffering function
- ○ I/O buffer is acquired automatically for I/O processing.

◆ Compact design suitable for ROM programming

Features of GOFAST

◆ Created on the basis of FPT3.0 by USSOFT

◆ Complies with ANCI-C (JIS X 3010)

◆ Supports GHS, GNUPro, and IAR compilers

AUTO VERIFICATION SYSTEM

The following auto verification systems are supported by the V850 microcontrollers.

XO850: Auto verification system for V850 microcontrollers

XO850 is an auto verification system for the V850 microcontrollers.
At the test process (the final process in software development), this system performs auto execution and auto evaluation using the actual target hardware, providing support for test automation.

Features

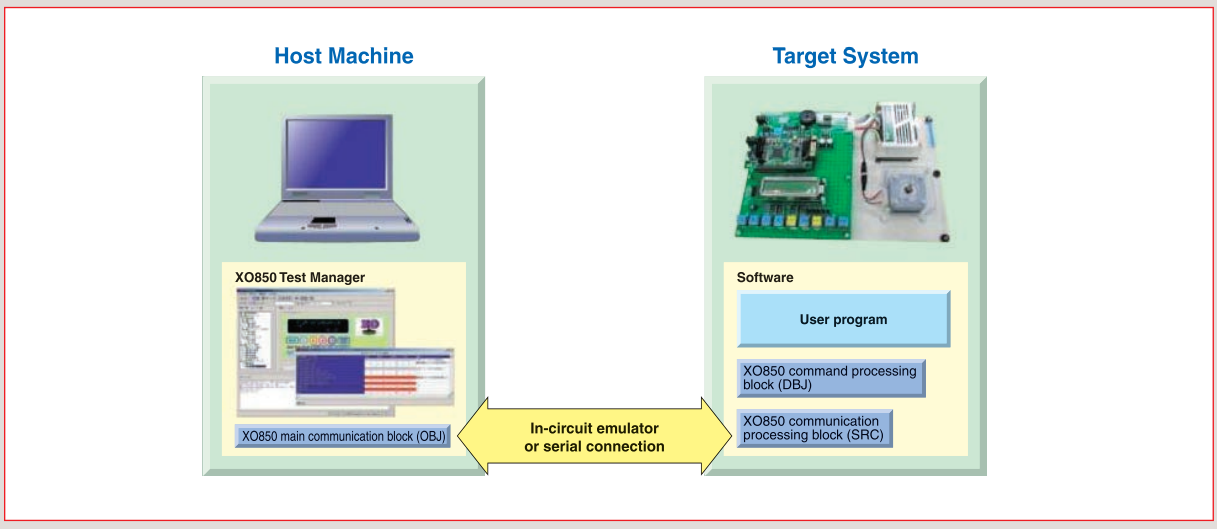
◆ Improved execution of tedious repetitive and regression tests
Full testing after each software revision is tedious and time-consuming. Test automation enables regression tests to be performed more easily, for improved software quality.

◆ Executes tests that are too complex or too large to be executed manually.
With the advent of ever more complex software, an increasing number of tests are endurance tests or other tests too complex for manual operation. Test scripts can be used to enable implementation of abnormality-related tests or other complex tests, and it saves time when implementing very large tests.

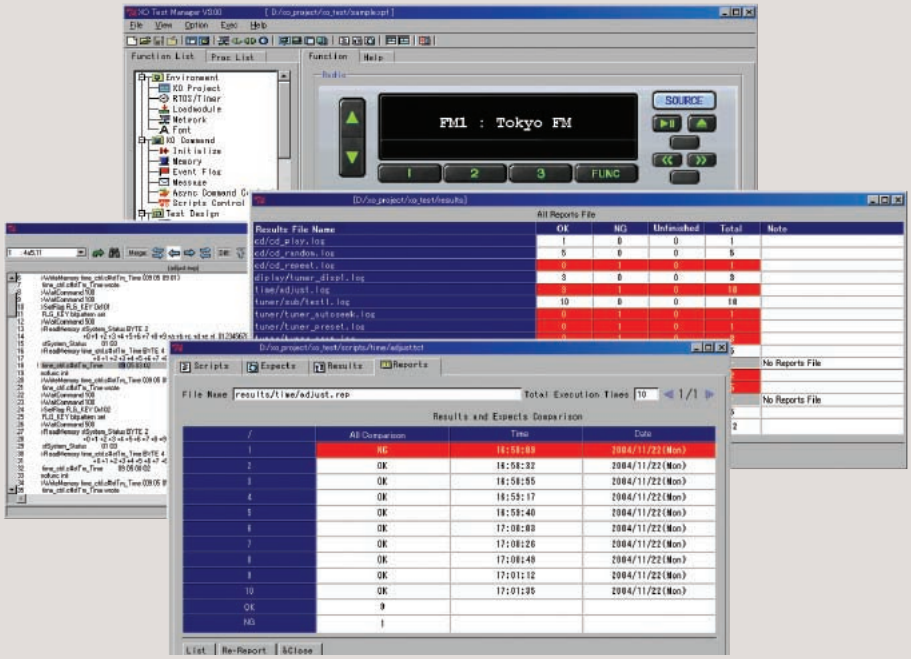
◆ Facilitates reproduction of abnormalities
When an abnormality is discovered, it is often difficult to remember the execution steps that preceded the abnormality. Test automation includes recording these execution steps, which facilitates and helps ensure accuracy when reproducing the abnormality.

Configuration

Tests are performed using a host machine connected to the target system.
The XO850 Test Manager, which is installed in the host machine, manages the tests by executing the tests, gathering the test results, automatically comparing the test results to the expected values, etc.



XO850 Test Manager (screen example)



Functions

◆ Support for creating test scenarios
- Auto generation of test scenarios from virtual target's operations
- Auto generation of test scenarios from actual device's operations

◆ Auto execution of test scenarios
- Enables execution of multiple test iterations or multiple consecutive test scenarios
- Enables execution of test scenarios concurrent with condition judgments

◆ Auto comparison of execution results and expected values
- When execution of test scenario ends, the pass/fail results are automatically displayed in a readable format.
- Displays a report describing the execution conditions for all test scenarios

◆ Use of upstream resources
- Verification logs from design stages can be used to make test script generation more efficient.
- Analysis of abnormalities found during testing is facilitated by links to a status transition table.
- Coverage can be viewed at the status transition table level, enabling confirmation of a test's coverage.

Use Conditions

◆ Load module

The load module is generated by the V850 microcontrollers C compiler package (CA850). The RX850 and RX850 Pro real-time operating systems for V850 microcontrollers are also supported when the real-time OS is used.

◆ Communication tools

One of the following is required for communications between the host machine and the target device.
- One serial communication channel for the device
- An in-circuit emulator (IE-703002-MC, IE-703102-MC, IE-V850E-MC, IE-V850E-MC-A, IE-V850ES-G1, or QB-V850ESSX2)

Applilet

The following device driver configuration tools are available.

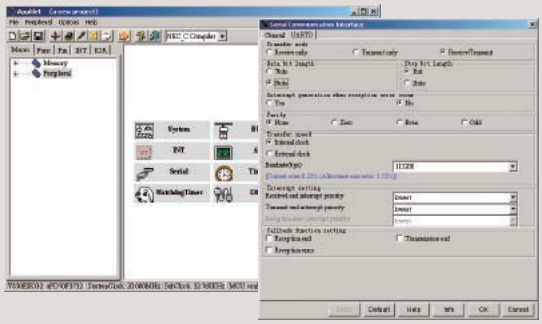
Applilet for V850ES/Kx2:	Device driver configuration tool for V850ES/KE2, V850ES/KF2, V850ES/KG2, and V850ES/KJ2
Applilet for V850ES/Hx2:	Device driver configuration tool for V850ES/HE2, V850ES/HF2, V850ES/HG2, and V850ES/HJ2
Applilet for V850ES/Jx2:	Device driver configuration tool for V850ES/JG2 and V850ES/JJ2
Applilet for V850ES/Fx2:	Device driver configuration tool for V850ES/FE2, V850ES/FF2, V850ES/FG2, and V850ES/FJ2
Applilet for V850ES/Sx2:	Device driver configuration tool for V850ES/SG2 and V850ES/SJ2
Applilet2 for V850ES/Sx3:	Device driver configuration tool for V850ES/SG3 and V850ES/SJ3
Applilet2 for V850ES/Fx3:	Device driver configuration tool for V850ES/FE3, V850ES/FF3, V850ES/FG3, V850ES/FJ3, V850ES/FK3, V850ES/FE3-L, V850ES/FF3-L, and V850ES/FG3-L
Applilet2 for V850ES/Jx3, V850ES/Jx3-L:	Device driver configuration tool for V850ES/JG3, V850ES/JJ3, V850ES/JF3-L, and V850ES/JG3-L

When Applilet is used, setup source files for on-chip peripheral functions can be automatically generated following a simple selection process that does not require consulting the manual.

Operation steps

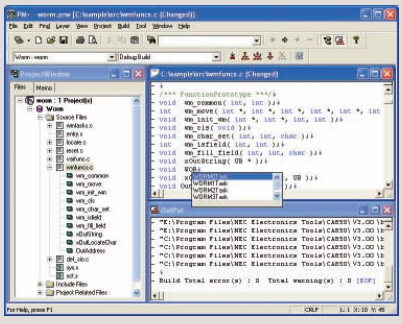
1. Set up on-chip peripheral functions

Select the target model, then enter settings as required for the peripheral functions to be used.



2. Generate code

Source files for each function are generated automatically.



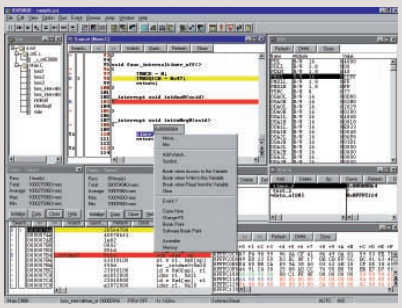
3. Add or revise code as needed.

4. Build

The project files used by the Project Manager are also generated automatically. These project files are loaded before building the target object.

5. Debug

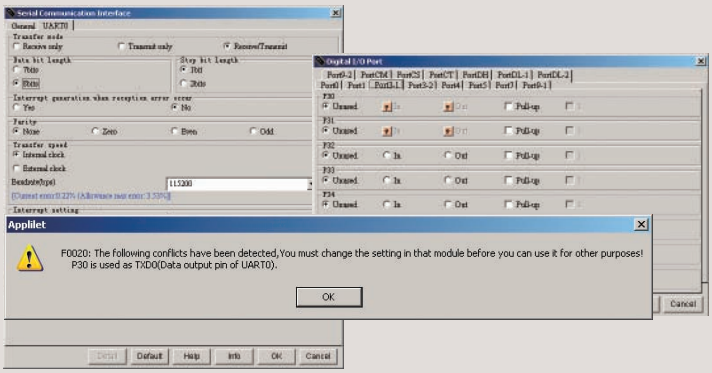
Use a debugger or simulator to perform debugging.



Features

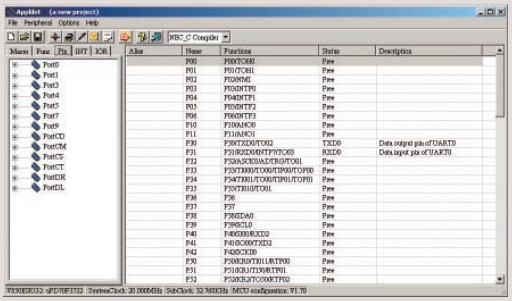
◆ Conflict check among interactive type input resources

In addition to providing a digital I/O port function, ports provide various alternate functions. The conflict check function ensures that there is no overlap between ports being used by the I/O port function and ports being used by an alternate function.


Applilet
F0020: The following conflicts have been detected,You must change the setting in that module before you can use it for other purposes!
P30 is used as TXD0(Data output pin of UART0).
OK

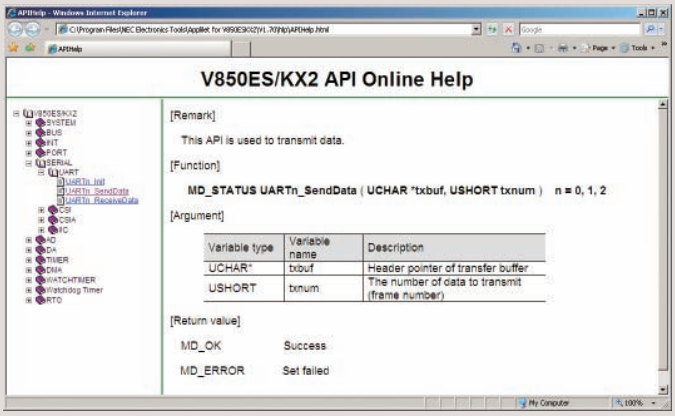
◆ Port aliases

The alternate functions of each port can be referenced.



◆ On-line help

Help descriptions of various functions in automatically generated source code can be referenced.

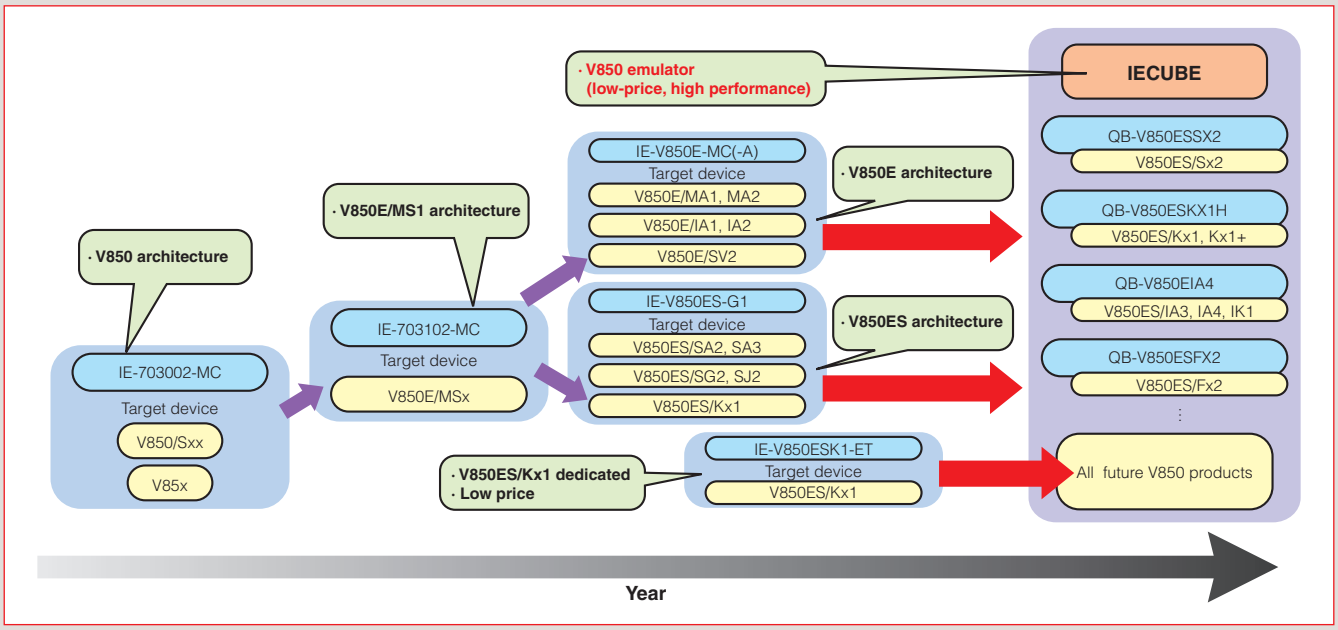

V850ES/KX2 API Online Help
[Remark]
This API is used to transmit data.
[Function]
MD_STATUS UARTn_SendData (UCHAR *txbuf, USHORT txnum) n = 0, 1, 2
[Argument]
Variable type | Variable name | Description
UCHAR* | txbuf | Header pointer of transfer buffer
USHORT | txnum | The number of data to transmit (frame number)
[Return value]
MD_OK Success
MD_ERROR Set failed

IECUBE SERIES

The following IECUBE series in-circuit emulators are supported by the V850.

QB-V850ESSX2:	V850ES/SG1, V850ES/SG2, V850ES/SG2-H, V850ES/SJ2, V850ES/SJ2-H, V850ES/JG2, V850ES/JJ2, V850ES/JJ3, V850ES/JG3, V850ES/JF3-L[Note], V850ES/JG3-L[Note], V850ES/SG3, V850ES/SJ3
QB-V850EIA4:	V850E/IA3, V850E/IA4, V850ES/IK1
QB-V850ESKX1H:	V850ES/KE1, V850ES/KE1+, V850ES/KE2, V850ES/KF1, V850ES/KF1+, V850ES/KF2, V850ES/KG1, V850ES/KG1+, V850ES/KG2, V850ES/KJ1, V850ES/KJ1+, V850ES/KJ2
QB-V850ESFX2:	V850ES/FE2, V850ES/FF2, V850ES/FG2, V850ES/FJ2, V850ES/HE2, V850ES/HF2, V850ES/HG2, V850ES/HJ2
QB-V850ESIE2:	V850ES/IE2
QB-V850ESFX3:	V850ES/FE3, V850ES/FF3, V850ES/FG3, V850ES/FJ3, V850ES/FK3, V850ES/HE3, V850ES/HF3, V850ES/HG3, V850ES/HJ3, V850ES/FE3-L, V850ES/FF3-L, V850ES/FG3-L
QB-V850EMA3:	V850E/MA3
QB-V850EIX3:	V850E/IF3, V850E/IG3

Note planned to be supported



Features

◆ Low price
- 1/3 to 1/4 price of existing high-performance emulators
- Debugger "ID850QB" and simple flash memory programmer included

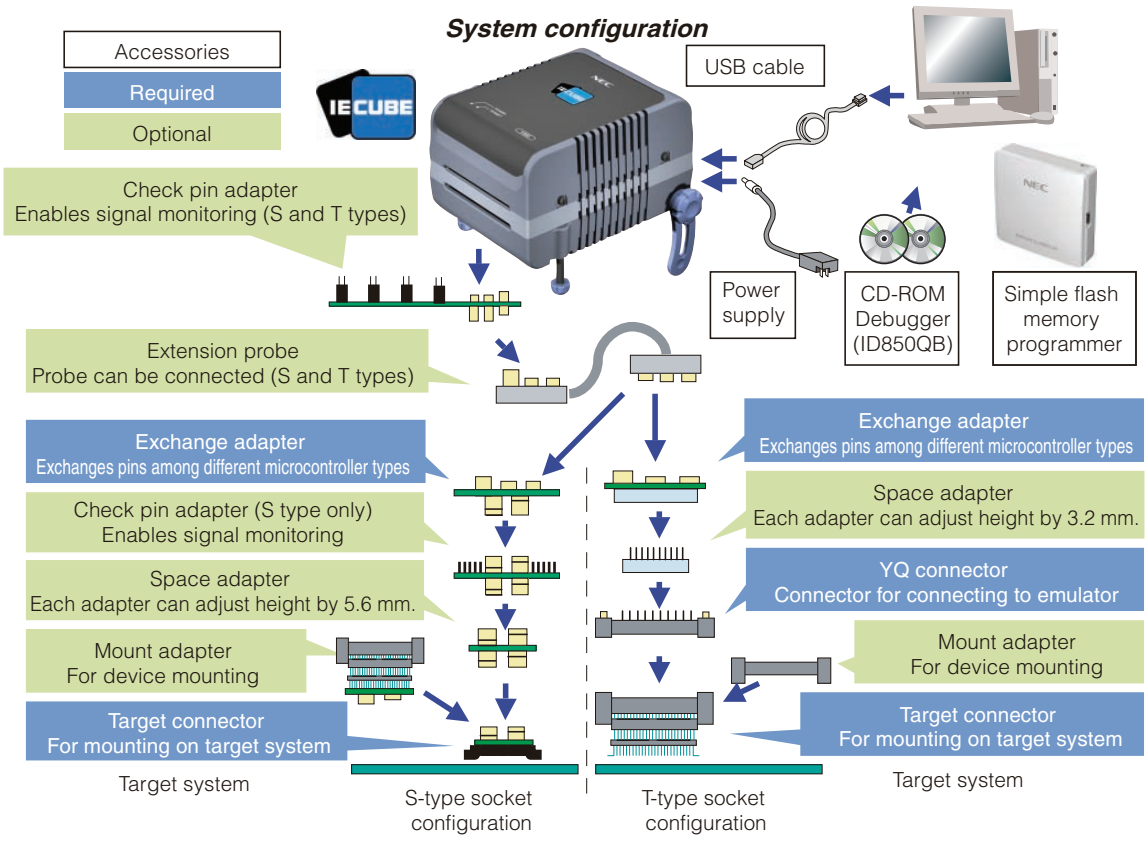
◆ Easy setup
- Separately sold emulator and emulation board combined
- USB (1.1/2.0) employed for communication with host machine

◆ Many debugging functions
- Functions equivalent to high-performance emulator (coverage and external memory emulation are optional.)
- Frequently used time measurement function as well as real-time monitor and RAM monitor functions enhanced

◆ Reinforced maintainability
- Self-diagnostic function provided for smooth trouble-solving

◆ Compact and lightweight
- Palm-sized for easy transportation

System configuration



O Accessories
- Debugger (ID850QB), simple flash memory programmer, and documentation are provided.
- The following sockets are provided in the following packages that include sockets.
  Exchange adapter and target connector (S type only)
  Exchange adapter, YQ connector, and target connector (T type only)

MINICUBE SERIES

The following products are available as on-chip debug emulator "MINICUBE series" for V850 microcontrollers.

QB-MINI2 (Alias: MINICUBE2)	V850ES/HE2, V850ES/HF2, V850ES/HG2, V850ES/HJ2, V850ES/HE3, V850ES/HF3, V850ES/HG3, V850ES/HJ3, V850ES/IE2, V850ES/JF3-L[Note 2], V850ES/JG2, V850ES/JG3, V850ES/JG3-L[Note 2], V850ES/JJ2, V850ES/JJ3, V850ES/KE2, V850ES/KF2, V850ES/KG2, V850ES/KJ2, V850E/IF3, V850E/IG3, V850ES/KE1[Note 3], V850ES/KF1[Note 3], V850ES/KG1[Note 3], V850ES/KJ1[Note 3], V850ES/KE1+, V850ES/KF1+, V850ES/KG1+, V850ES/KJ1+, V850ES/FE2, V850ES/FF2, V850ES/FG2, V850ES/FJ2, V850ES/FE3, V850ES/FF3, V850ES/FG3, V850ES/FJ3, V850ES/FK3, V850ES/FE3-L, V850ES/FF3-L, V850ES/FG3-L, V850ES/SG2, V850ES/SG2-H, V850ES/SJ2, V850ES/SJ2-H, V850ES/SG3, V850ES/SJ3, V850E/IA3, V850E/IA4, V850ES/IK1, V850E/MA3
QB-V850MINI (Alias: MINICUBE)	V850ES/HE2, V850ES/HF2, V850ES/HG2, V850ES/HJ2, V850ES/HE3, V850ES/HF3, V850ES/HG3, V850ES/HJ3, V850ES/JF3-L[Note 2], V850ES/JG2, V850ES/JG3, V850ES/JG3-L[Note 2], V850ES/JJ2, V850ES/JJ3, V850ES/KJ2, V850E/IG3, V850E/ME2, V850E/MA3, V850E/IA4, V850E/SV2, V850E2/ME3, V850ES/SG2, V850ES/SG2-H, V850ES/SG3, V850ES/SJ2, V850ES/SJ2-H, V850ES/SJ3, V850ES/KE1[Note 4,5], V850ES/KF1[Note 4,5], V850ES/KG1[Note 4,5], V850ES/KJ1, V850ES/KE1+[Note 4], V850ES/KF1+[Note 4], V850ES/KG1+[Note 4], V850ES/KJ1+, V850ES/KE2[Note 4,6], V850ES/KF2[Note 4,6], V850ES/KG2[Note 4,6], V850ES/KJ2[Note 4,6], V850ES/FE2, V850ES/FF2, V850ES/FG2, V850ES/FJ2, V850ES/FE3, V850ES/FF3, V850ES/FG3, V850ES/FJ3, V850ES/FK3, V850ES/FE3-L, V850ES/FF3-L, V850ES/FG3-L

Notes 1. As of November 2007. Target devices will be added sequentially.
Only V850 microcontrollers are described as the target devices of MINICUBE2, but 78K microcontroller target devices also exist.

2. Planned to be supported.

3. Only single power supply products are supported.

4. A self check board will be required when MINICUBE is used.

5. Note that the P00 pin outputs a low level during a reset.
If this causes a problem, it can be avoided by using the QB-V850ESKX1-DA (separately sold product).

6. Note that the P00 pin outputs a low level during a reset.
The subclock cannot be selected as the count clock of timer H1. The operation cannot be guaranteed when the subclock is set for the TMHMP1 register or as the count clock.

On-chip debug emulator with programming function "MINICUBE2"

"MINICUBE2"

MINICUBE2

Features

◆ On-chip debugging and flash programming
A debug function enabling the detection of bugs in a program to be integrated into a microcontroller, and a programming function to write a developed program to the microcontroller are mounted to cover the processes from debugging through mass production.

◆ Low-price
Further reduction of initial costs for development or mass production can be achieved because of its low price, 1/3 of the existing model MINICUBE.

Changing of center LED color according to operation status

◆ 8-bit to 32-bit support
Cost reduction through the diversion of development environments and sharing of mass production systems can be achieved due to MINICUBE2 capability to cover the processes from development through mass production for various microcontrollers of different specifications.

◆ Single power supply flash memory product support
The support of all single power supply flash memory products to be released is planned, enabling continued use in the future.

◆ Compact, lightweight, and strap attachable
Saving of space in development and mass production and high portability can be achieved thanks to its compact size (48 × 48 × 12.4 mm) which is 1/4 in volume of the existing model MINICUBE and lightweight.

MINICUBE2 System Configuration

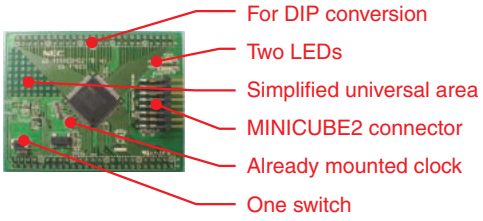
On-chip debugging and flash programming can be performed using a simple system configuration.

MINICUBE2 Option Products

A wide variety of option products is available.

★Trial CPU board

Recommended for users wishing to operate the microcontroller right away.



Quick Start Guide

The quick start guide on the NEC Electronics Web site can be used to try out the line of microcontroller development.

★Unbundled cable

Connection with MINICUBE2 can be established by simply mounting a test pin in the target system.
(This is a product of Naito Densei Machida Mfg. Co., Ltd.)

★SICA cable

Space of the connector mount area on the target system can be saved.
(This is a product of Tokyo Eletech Corporation.)

Differences with MINICUBE

The main differences with the conventional MINICUBE are shown below.
Refer to the function list on the next page for detailed differences in functions.

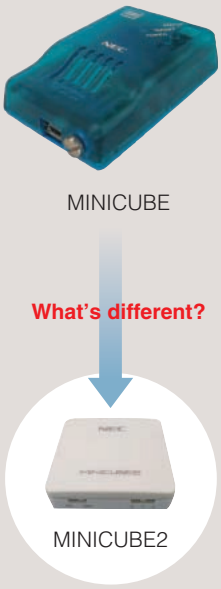
■ Low price
About 1/3 of conventional models

■ Compact and lightweight
About 1/4 in volume and 1/3 in weight

■ 8-bit to 32-bit microcontroller support
MINICUBE2 is also supported by 78K microcontrollers.

■ Different target interface
MINICUBE employs a J-TAG interface (5 pins).
MINICUBE2 employs a serial interface, such as UART (2 to 4 pins).
* Note that the target interface is not compatible.

■ Using user resources
MINICUBE2 uses user resources, such as memory for debugging.
* The use of MINICUBE may be appropriate in some cases, because some memory spaces and serial interfaces will be disabled for use.



V850 IECUBE, MINICUBE, MINICUBE2, SM+ Function Comparison

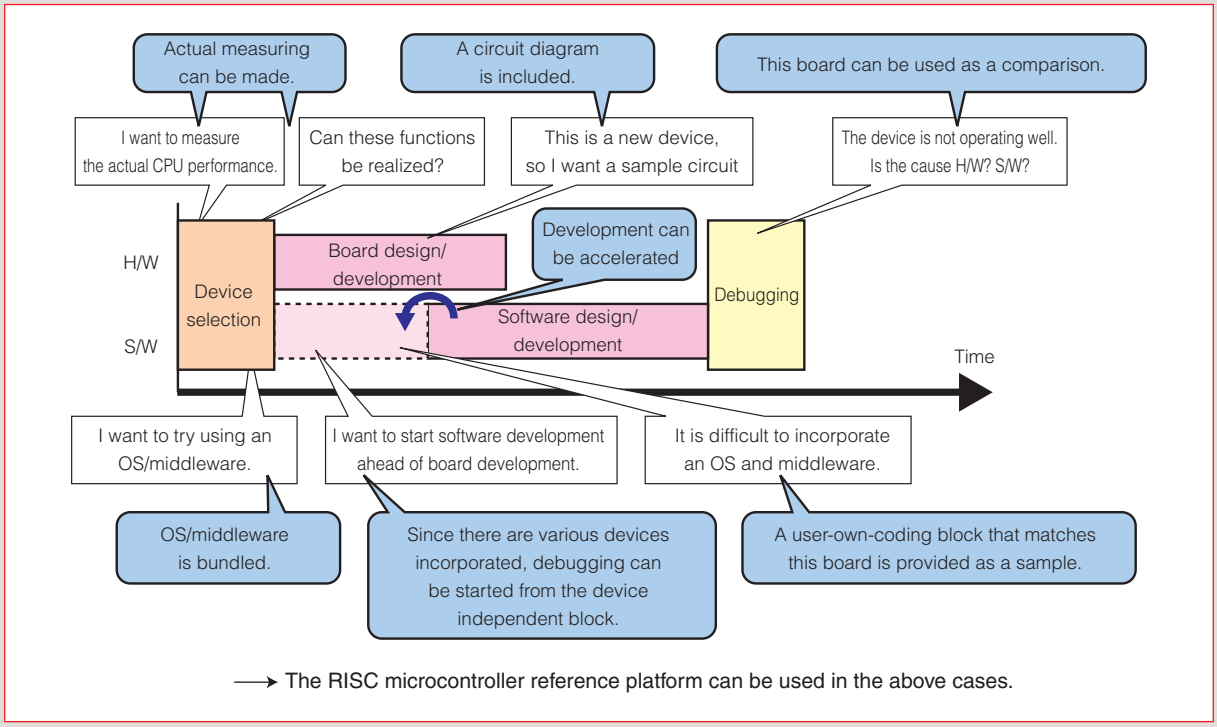
		In-Circuit Emulator	On-Chip Debug Emulator		System Simulator
		QB-V850XXX (IECUBE)	QB-V850MINI (MINICUBE)	QB-MINI2 (MINICUBE2)	SM+
Maximum operating frequency		Equivalent to target device			Same frequency as target device is settable. Actual operating frequency depends on PC, program, or debug function used.
Emulation memory capacity	Internal ROM	1 MB	Internal ROM capacity of target device		1 MB
	Internal RAM	60 KB	Internal RAM capacity of target device		60 KB
	External memory	16 MB (optional)	None		Unlimited
Event function	Execution events	10 points	2 points when shared between execution and access events	2 points when shared between execution and access events Note 1	64 points when shared between execution and access events
	Access events	6 points			
	Event link	1 point (up to 4-stage sequence possible)	1 point (up to 2-stage sequence possible)		16 points (up to 4-stage sequence possible)
Break function	Hardware break	16 points	2 Note 1		64 points
	Software break	2000 points	Internal ROM area: 4 points RAM area: 2000 points		None
	Forcible break	Enabled		Enabled Note 2	Enabled
	Step execution	Enabled			
	Fail-safe break	Enabled	Disabled		Enabled
Trace function	Trace memory capacity	256 K frames	None		Settable with 0 to 16 M frames (4 K frames by default)
	Trace items	With branch instruction (data/address), accessing (data/address), time stamps, and interpolation function			All instructions (address/data), accessing (address/data), time stamps
Time measurement function	Program execution (start – end) measurement	Enabled	Enabled (disabled with V850E/ME2, V850E/SV2)	Enabled	
	Inter-event measurement	Enabled (7 measurements)	Not available		Enabled (8 measurements)
	Display items of inter-event measurement results	Total value, pass count, maximum value, minimum value, average value			Total value, pass count, maximum value, minimum value, average value
	Timeout break	Enabled			Not available
Real-time RAM monitor function		256 bytes × 8 points	Not available Note 3		Entire RAM area
Coverage function (execution coverage)	Memory capacity	Entire ROM area + any 1 MB area (optional)	Not available		Entire ROM area + any 1 MB area
Mask function		RESET, WAIT, HLDRQ, NMI, STOP	RESET, WAIT, HLDRQ, NMI, STOP	RESET (only external)	Not available
Flash memory programming function		Not available (simple flash memory programmer included)	Not available (only downloading during debugging)	Available	—
Exclusive user memory space for on-chip debugging		—	Internal ROM: 0 byte Internal RAM: 0 byte	Internal ROM: 2 K + 12 bytes Internal RAM: 10 to 16 bytes	—
Exclusive function pin for on-chip debugging		—	DCK, DMS, DDI, DDO, DRST	UART: RXD, TXD CSI-H/S: SI, SO, SCK, H/S	—
PC interface		USB2.0, USB1.1			—
Simulation function		—			Simulation of simple external components, such as buttons and LEDs, displaying of I/O signal waveforms, customizing of external components, etc.

Notes 1. There are no devices without an on-chip debug function.
2. A forcible break cannot be performed when interrupts are disabled (DI) or if communication I/F (UART or CSI) interrupts are masked.
3. The pseudo RRM function which performs monitoring by momentarily stopping program execution is available.

SolutionGear

The following products are available as RISC microcontroller reference platforms.

SG-703111-1: V850E/ME2 CPU board
SG-703500-1: V850E2/ME3 CPU board
SG-MOTHER-1: Motherboard


Actual measuring can be made.
A circuit diagram is included.
This board can be used as a comparison.
I want to measure the actual CPU performance.
Can these functions be realized?
This is a new device, so I want a sample circuit
The device is not operating well. Is the cause H/W? S/W?
H/W
S/W
Device selection
Board design/ development
Development can be accelerated
Software design/ development
Debugging
Time
I want to try using an OS/middleware.
I want to start software development ahead of board development.
It is difficult to incorporate an OS and middleware.
OS/middleware is bundled.
Since there are various devices incorporated, debugging can be started from the device independent block.
A user-own-coding block that matches this board is provided as a sample.

→ The RISC microcontroller reference platform can be used in the above cases.

Features

The reference platform comprises the CPU board provided for each microcontroller, and a CPU-independent motherboard.

The reference platform sold by NEC Electronics comes in a set that includes the following.

- ◆ Binary including the rights to use the RX Series (μITRON) on the reference platform
- ◆ Binary including rights to use middleware on the reference platform
- ◆ Sample driver source code for peripheral devices incorporated on board
- ◆ Board circuit diagram

These features enable the following.

- Measuring of user program benchmarks using the actual CPU
- Evaluation of RTOS and middleware supplied by NEC Electronics
- Utilization of reference information when designing user target board
- Prototype development prior to user target board completion
- Utilization of reference information for device driver when porting RTOS to target board
- Utilization as object of comparison when doubts arise about target board operation.

By simply acquiring additional development tools, therefore, this reference platform can be used as a turnkey solution.

◆ Multi from Green Hills Software, Inc. or the remote monitor debugger of PARTNER from Midas Lab Co., Ltd. can be used.

Target Device

◆ V850E/ME2
◆ V850E2/ME3

Features of Motherboard

◆ Hardware for speech I/O and other middleware
◆ Industry-standard (PC-compatible) PCI, ISA, PCMCIA, E-IDE, Ethernet, SIO, parallel, keyboard, mouse, and other interfaces
◆ Can be used with PC unit, power-supply, and peripheral equipment (ATX-compatible board size)
◆ Support of all CPUs in V850E (CPU independent)
◆ Support of partner tools such as Multi from Green Hills Software, Inc. and the PARTNER remote monitor debugger from Midas Lab Co., Ltd.

Incorporated Software

NEC Electronics provides the following RTOS and middleware on this board.

◆ μITRON-compliant real-time OS, RX Series (RX850 Pro)
◆ TCP/IP software Library (RX-NET)
◆ Various device drivers (samples)

PG-FP5

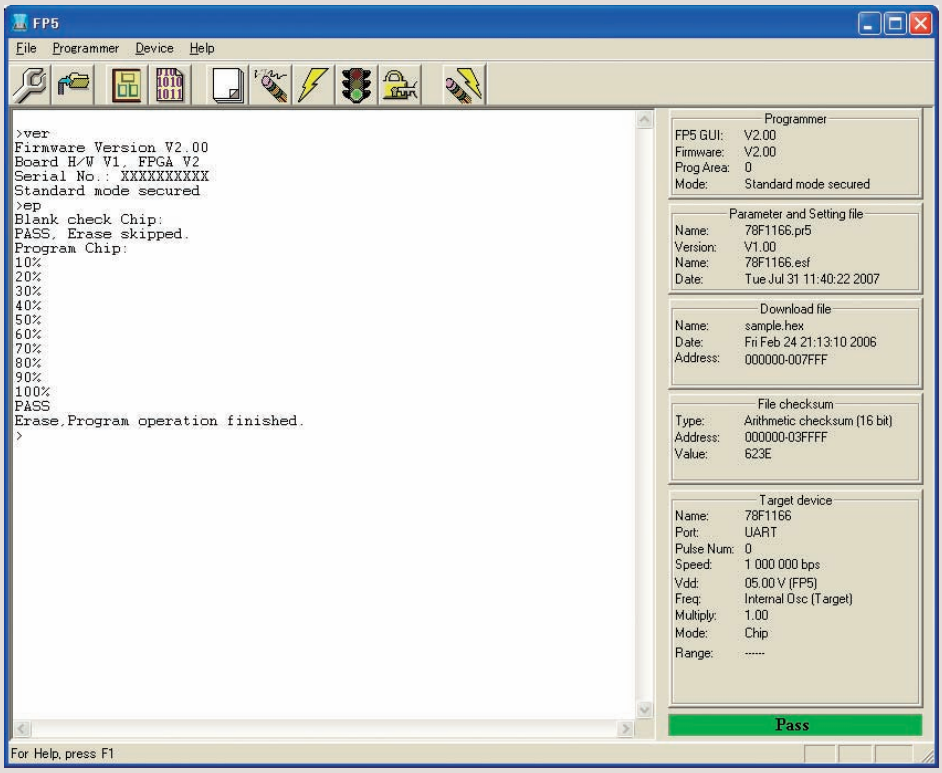
The following flash memory programmer is available.

PG-FP5: Microcontroller general-purpose flash memory programmer

Features

PG-FP5

- ◆ Supports writing of all NEC Electronics microcontrollers with on-chip flash memories
- ◆ Provides a variety of code storage functions (up to eight types of codes and microcontroller information can be retained)
- ◆ Can automatically set device-specific information required for writing by using parameter files
- ◆ Can perform “on-board writing” and “program adapter writing”
- ◆ Compact, space-saving, user-friendliness button layout
- ◆ Can perform standalone operation and operation from a dedicated Windows application
- ◆ Can support external automatic control thanks to standard command control support
- ◆ Supports a remote interface function that enables the operation and checking of writing and PASS/ERROR displays by using an external device



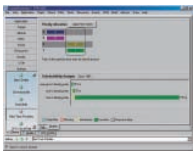
PARTNERS

NEC Electronics works together with partners who provide various types of development tools for the 78K and V850 microcontrollers to support our customers' system building requirements. By passing on to these partners the hardware and software information we develop, they can tailor product development to our customers' needs.
Only information on major products is listed below. For information on other products, refer to each partner company Web site.
Contact information of each partner listed in Partner Contact Information.
For support outside of Japan, contact each partner.

OSs, Middleware, Drivers (1/5)

RTA product family (RTA-OSEK, RTA-COM, RTA-CAN)

[Manufacturer] LiveDevices Ltd. (ETAS Group)
[Distributor] ETAS K. K.
[Target device] V850
[Features]
- ◆ Software product group mainly consisting of OSs conforming to OSEK/VDX standard
- ◆ OSEK kernel adopting original optimization (patented)
- ◆ Each product capable of stand-alone operation
- ◆ Software trace tool RTA-TRACE supported
- ◆ Conforms to MISRA C



TOPPERS-Pro

[Manufacturer/Distributor] A.I. Corporation
[Target device] V850
[Features]
TOPPERS-Pro is a real-time OS for embedded applications with an RLL function implemented into a real-time kernel conforming to μITRON4.0 specifications. The biggest feature of the RLL function is to have a link function at the server side and a loader function at the target side, resolving addresses so that the target and server operate in coordination during a communication session, and thus realizing a dynamic loading function (function to dynamically add, delete, or update modules) with a compact code size.

IPNET

[Manufacturer] Interpeak AB
[Distributor] A.I. Corporation
[Target device] V850
[Features]
IPNET is a full-specification IPv4/v6 dual stack that was developed by Interpeak in Sweden, in conformance with RFC standards and centers on Internet protocols for embedded applications. It includes IPSec in the basic package and supports multiple network I/Fs and routing tables. Dynamic routing functions and virtual routing are also supported, as well as the use with routers. A wealth of optional protocols such as those related to security is also available.

eBoss Kernel

[Manufacturer/Distributor] COMPUTER HI-TECH INC.
[Target device] V850
[Features]
Original super high-speed startup kernel that supplies an environment equivalent to Linux
- ◆ Kernel operation has been verified so that customers can concentrate on application development.
- ◆ Easily realizes remote monitoring and controlling because TCP/IP, pppd, telnetd, ftpd, httpd, and SMTP are supported as standard
- ◆ Conforms to POSIX and allows effective use of Linux and GPL resources.

XTNDAccess Blue SDK

[Manufacturer] iAnywhere Solutions K.K.
[Distributor] A.I. Corporation
[Target device] V850
[Features]
Bluetooth protocol stack "XTNDAccess Blue SDK" for embedded applications is a protocol stack conforming to Bluetooth, the international standard of short-distance wireless communication. It has a record of having been employed throughout the world and can be easily transplanted by customers. The latest version and latest profile are supported any time with a very compact design. XTNDAccess Blue SDK has been widely used in systems such as automobiles, mobile telephones, and printers. Versions for Windows CE and Linux are also available.

H.264 encoder/decoder software

[Manufacturer/Distributor] Techno Mathematical Co., Ltd.
[Target device] V850
[Features]
- ◆ H.264 encoder/decoder software supporting one-segment broadcasting reception
- ◆ Capable of encoding (decoding) H.264 without external hardware or dedicated DSP
- ◆ Original algorithm using mathematical techniques, realizing high definition and low power consumption
- ◆ Fully conforms to H.264 (ISO/IEC 14496-10) standards without any problem of compatibility
- ◆ Compatible with existing processor families

OSs, Middleware, Drivers (2/5)

WMA decoder software

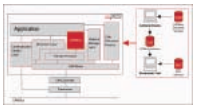
[Manufacturer/Distributor] Techno Mathematical Co., Ltd.
[Target device] V850
[Features]

- Windows Media Audio decoder software having high sound quality and low power consumption
- Can easily support Windows Media format in combination with WMV9 decoder software.
- Original algorithm using mathematical techniques, realizing high sound quality and low power consumption
- Compact memory areas (ROM and RAM)
- Compatible with existing processor families

CANbedded

[Manufacturer/Distributor] Vector Japan Co., Ltd.
[Target devices] 78K0, V850
[Features]

CANbedded supplies source code components meeting specifications concerning network establishment for communication between ECUs using the CAN protocol of the automobile industry, so that data exchange between ECUs on a network using the CAN protocol can be easily integrated.



WMV9 decoder software

[Manufacturer/Distributor] Techno Mathematical Co., Ltd.
[Target device] V850
[Features]

- Decoder software supporting WMV9 (Main Profile/Simple Profile)
- Capable of decoding WMV9 without external hardware or dedicated DSP
- Original algorithm using mathematical techniques, realizing high definition and low power consumption
- Compatible with existing processor families

OSVM™ Universe

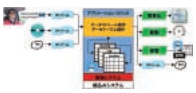
[Manufacturer] Esmertec AG (Switzerland)
[Distributor] Esmertec K. K.
[Target devices] V850
[Features]

- Client/server type solution for M2M (machine-to-machine) systems
- Dynamic updating of software and services for many devices
- Bidirectional communication
- Seamless integration with back office system
- OSVM embedded platform with memory size of as tiny as 32 KB

ENCIRQR™ Data Foundation™ Framework (ENCIRQ DFF)

[Manufacturer/Distributor] Encirq Corporation
[Target device] V850
[Features]

- High-speed and compact engine (minimum footprint: 24 KB)
- Capable of C code generation from SQL and, using components, embedding only necessary functions
- Can perform optimal data distribution layout by using both in-memory data and various permanent media
- Framework structure allowing customization of additional functions to satisfy customer needs
- Can reduce power consumption and memory footprint through optimum data and program allocation.



Jbed™ Advanced

[Manufacturer] Esmertec AG (Switzerland)
[Distributor] Esmertec K. K.
[Target device] V850
[Features]

- Java™ run-time platform employing innovative technologies and optimized for mobile telephones and embedded devices
- Multitasking function enabling simultaneous execution of multiple Java applications
- Always-on function enabling execution of Java at any time
- FastBCC compilation engine minimizing power consumption and executed at high speeds with small footprint
- Supports wide-ranging profiles, JSR, and operator expansion

osCAN

[Manufacturer/Distributor] Vector Japan Co., Ltd.
[Target devices] 78K0, V850
[Features]

- osCAN is a pre-emptive, real-time multi-task OS optimized for microcontrollers. A compact but powerful OS kernel has been achieved through the experiences of Vector during development of microcontroller OSs and drivers over many years. osCAN has acquired a qualification of OSEK/VDX Ver. 2.2 specifications.
- This open standard for the automobile industry has been created, taking long-term prospects into consideration.

Jbed™ CDC

[Manufacturer] Esmertec AG (Switzerland)
[Distributor] Esmertec K. K.
[Target device] V850
[Features]

- Front-end Java™ run-time platform optimized for embedded systems
- Fully compatible with Java ME CDC
- Supports industry's standards such as OSGi, MHP, OCAP, and BD-J
- Designs minimizing memory resources needed and high-performance FastDAC compilation engine
- Reliability and durability proved by record of having been employed in fields throughout the world

OSs, Middleware, Drivers (3/5)

KASAGO IPv6-based development kit

[Manufacturer/Distributor] Elmic Wescom, Inc.
[Target devices] V850
[Features]

- High-speed TCP/IP protocol stack supporting IPv6 and dedicated to embedded applications
- IPv6 Ready Logo Phase-2 approved
- Support of ZERO Copy function
- Compact code size of about 150 KB (IPv4/IPv6 Dual)
- Many optional software products such as IPSec, SNMP, HTTPD, POP3&SMTP, and SIP

KASAGO TCP/IP (IPv4) -based development kit

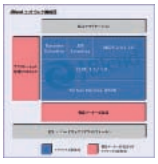
[Manufacturer/Distributor] Elmic Wescom, Inc.
[Target devices] V850
[Features]

- High-speed TCP/IP protocol stack dedicated to embedded applications
- Support of ZERO Copy function
- Compact code size of about 100 KB
- BSD4.4 socket I/F supported
- Wealth of optional software products such as PPP, SNMP, HTTPD, POP3&SMTP, and SIP

JAVA platform for embedded computing "JBlend"

[Manufacturer/Distributor] Aplix Corporation
[Target device] V850
[Features]

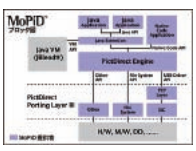
- Java execution environment optimized for household appliances such as HDTVs, video cameras, and printers, as well as mobile telephones
- Supplies optimized solutions to various third-party products to shorten development period.
- Supports Java specifications (profile/extension) based on Java ME CDC/CLDC.
- Memory-saving JBlend [nano] that operates from 64 KB ROM also added to lineup
- Quickly supports new Java specification and manufacturer's original specification by sophisticated modularization and standardization.



Puri-Puri MoPiD

[Manufacturer/Distributor] Aplix Corporation, eSOL Co., Ltd.
[Target device] V850
[Features]

- Realizes image printing by directly connecting a mobile telephone and a printer.
- Conforms to PictBridge standard that has become widespread in the field of direct printing.
- Printer supporting PictBridge can be used regardless of the manufacturer and model.
- Can also be used from applications for printing.
- Requests for porting and customization can also be supported. The number of development processes can be decreased.



Embedded Browser "Esprit"

[Manufacturer/Distributor] Websoft International Inc.
[Target device] V850
[Features]

- Source code can be supplied.
- Package designed for each market supplied
- ROM size of about 1 MB
- SDK supplied free of charge

Embedded Flash Player

[Manufacturer] Adobe Systems Incorporated
[Distributor] eSOL Co., Ltd.
[Target device] V850
[Features]

- Rich contents of Flash integrated to embedded devices
- Two products available: "Flash Player SDK" with various functions, depending on hardware conditions, and compact "Flash Lite".

PictBridge SDK "PictDirect"

[Manufacturer/Distributor] eSOL Co., Ltd.
[Target device] V850
[Features]

- Facilitates development of image input devices conforming to PictBridge specifications of CIPA standard
- Enables mutual connection between embedded systems as long as they support PictBridge
- Real-time OS, USB device stack, FAT file system, and development environment that have been verified together are separately available.

GRAPE USB solution products

[Manufacturer/Distributor] Grape Systems Inc.
[Target device] V850
[Features]

- "GR-USB series" consists of products implementing USB function and being independent of platform. Drivers of various classes supporting major controllers are available.
- Wide-range of solutions, including hosts with USB2.0 specifications, devices, OTG protocol, file systems, MTP, and PictBridge

OSs, Middleware, Drivers (4/5)

ThreadX/ThreadX μITRON

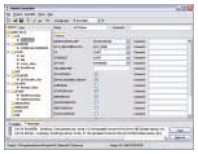
[Manufacturer] Express Logic Inc. (USA)
[Distributor] Grape Systems Inc.
[Target device] V850
[Features]

- ThreadX is a high-speed, compact, real-time OS that supplies an environment ideal for development of embedded applications that require real-time responses.
- Provides μITRON API to high end of ThreadX as a wrapper function allows use as μITRON 4.0.
- SMP version and MT supporting version also available

tresos ECU AUTOSAR Suite

[Manufacturer] 3SOFT GmbH
[Distributor] Elektrobit Nippon K. K.
[Target device] V850
[Features]

- Basic software module conforming to AUTOSAR
- Can easily configure software components with GUI.
- Open, plug-in interface



Fusion series

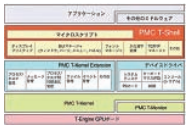
[Manufacturer] Unicoi Systems, Inc. (USA)
[Distributor] Grape Systems Inc.
[Target device] V850
[Features]

- Fusion series is middleware having an established track record and is easy to transplant, with RTSP, DHCP, PPP, PPPoE, FTP, Telnet, DNS, SNTP, RIP/RIP2, OSPF v2, NAT, RTP/RTCP, SNMPv2/v3, POP3, SMTP, HTTPS, and SOAP, in addition to TCP/IP that supports both IPv4 only and IPv4/v6.
- Browser and XML server also available

PMC T-Kernel

[Manufacturer/Distributor] Personal Media Corporation
[Target device] V850
[Features]

- Standard real-time OS that runs on T-Engine
- Many records of having been transplanted to T-Engine board and T-Engine appliance of various CPUs, such as VR microcontroller and V850 microcontroller
- Established track record including T-Kernel/OS having functions such as tasks and semaphores, and T-Kernel/SM that enhances flexibility of device drivers and middleware
- PMC T-Kernel Extension with state-of-the-art functions, such as file management, process management, task management, and virtual storage, also available
- Customization, tuning, and transplantation to new CPU upon request



DeepCore 3.0+

[Manufacturer/Distributor] E-Globaledge Corporation
[Target device] V850
[Features]

- DeepCore 3.0+ of embedded version is a highly flexible middleware subsystem that fully supports IrDA basic protocol and can freely combine IrDA application protocols required as solutions.
- DeepCore 3.0+ subsystem completely matches each protocol layer configuration of IrDA standards and all protocols are created with related but independent modules.
- Also supports newest standards of IrDA, including IrSimple, IrOBEX, IrFM, and IrCOMM standards.

PMC T-Shell development kit

[Manufacturer/Distributor] Personal Media Corporation
[Target device] V850
[Features]

- GUI middleware group with network function for standard T-Engine board
- Ideal for development of embedded systems having network and display because features such as display primitive, font manager, kana-kanji conversion, and TCP/IP manager are included
- Visual language “Microscript” provided. Programs in Microscript developed on PC can be executed on T-Engine as is.
- Enables easy and quick development of GUI applications

tresos ECU with OSEK plug-in

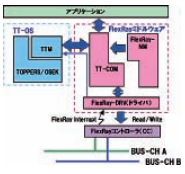
[Manufacturer] 3SOFT GmbH
[Distributor] Elektrobit Nippon K. K.
[Target devices] 78K0, V850
[Features]

- Operating system conforming to OSEK/VDX-OS 2.2.1 specifications
- Operating system conforming to OSEKtime 1.0 specifications
- Can easily configure OS resources with GUI.
- LIN driver and HIS I/O library also available
- Open, plug-in interface

FlexRay communication software set

[Manufacturer/Distributor] Witz Inc.
[Target device] V850
[Features]

- Software capable of realizing FlexRay communication that is expected to be the most promising as the next-generation automobile communication method
- Released as early as March 28, 2006 to TOPPERS Project members from TOPPERS Project
- This FlexRay communication software consists of a time trigger OS (TT-OS) that realizes time trigger processing necessary for FlexRay communication, and FlexRay communication middleware (TT-COM, FlexRay-NM, and FlexRay-DRV).



OSs, Middleware, Drivers (5/5)

Voice recognition middleware VORERO

[Manufacturer/Distributor] Asahi KASEI Corporation
[Target device] V850
[Features]
- Unspecified speaker recognition … No prior voice registration or special training required
- Excellent noise-resistance performance … Recognition performance under noise indicated in the track record of employment in automobiles (car navigation systems)
- Compact size and low required calculation amount … Operation on embedded RISC or OS
- Multi-language support … Supports 14 languages. Seamless support through common development tools and identical engine API
- Scalable support from commands consisting of a few dozen words up to nation-wide address recognition consisting of a few hundred thousand words

ubiquitous SSL

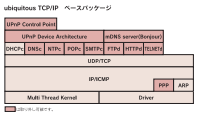
[Manufacturer/Distributor] Ubiquitous Corporation
[Target device] V850
[Features]
- Astonishingly compact code size (ROM: 25 to 42 KB, RAM: about 20 KB)
- Supports both server and client functions
- Independent of platform, capable of being implemented in environments other than ubiquitous TCP/IP

MatrixQuestUSB (USB host driver)

[Manufacturer/Distributor] TEPCO UQUEST, LTD.
[Target device] V850
[Features]
- USB host driver for embedded systems
- Supports high-speed operation (such as with μPD72010x) and On-the-Go
- Supports various controllers and classes

ubiquitous TCP/IP

[Manufacturer/Distributor] Ubiquitous Corporation
[Target device] V850
[Features]
- "Small", "lightweight", and "fast" TCP/IP solution for embedded systems (also supports IPv6)
- TCP/IP protocol stack and UPnP middleware conforming to RFC implemented as standard
- Record of having been employed in a wide range of areas covering home furnishing and digital household appliances, and many application examples
- Easy to expand when used with an add-on package such as SSL, AV, and USB Host
- Substantially lowers hardware cost by minimizing memory required



ubiquitous AV

[Manufacturer/Distributor] Ubiquitous Corporation
[Target device] V850
[Features]
- Supports UPnP AV
- Conforms to DLNA (Digital Living Network Alliance) Guideline 1.0 (Guideline 1.5 to be supported soon)
- Operation checked by various conformance tests
- Compact code size optimized for embedded systems

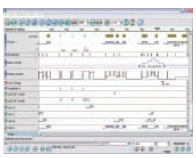
Voice recognition soft module LiteSpeech

[Manufacturer/Distributor] Soft Module Group, Mobility Systems Head Office
Panasonic System Solutions Company
Matsushita Electric Industrial Co., Ltd.
[Target device] V850
[Features]
- High-speed processing even under scarce resources
- High recognition accuracy even under noise environments thanks to an original method
- Easy multi-language support by language data replacement using a single engine
- Dynamic modification of recognition words through text registration
- No voice registration required, thanks to support of unspecified speaker recognition

Verification Tools (1/3)

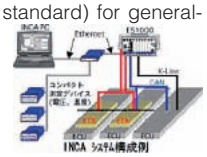
RTA product family (RTA-TRACE)

[Manufacturer] LiveDevices Ltd. (ETAS Group)
[Distributor] ETAS K. K.
[Target device] V850
[Features]
- Visualizes behaviors during actual application operation
- Verifies execution application by statistical analysis function
- Supports user trace point
- Flexible ECU link connecting host PC and target ECU supplied
- Easy integration with RTA-OSEK



INCA

[Manufacturer] ETAS GmbH (Germany)
[Distributor] ETAS K. K.
[Target devices] 78K0, V850
[Features]
Supplies an environment that makes final adaptation of an automobile ECU control program to an actual automobile, and optimizes control functions, as a total system together with software and hardware. Also supports a standardized interface (ASAM standard) for general-purpose use.



Verification Tools (2/3)

IBM Rational TestRealTime

[Manufacturer/Distributor] IBM Japan, Ltd.
[Target devices] 78K0S, 78K0, 78K0R, 78K4, V850
[Features]

- ◆ Can support test environments from native to simulator, ICE to actual machine.
- ◆ Supports C/C++/Java (J2ME/J2SE) languages.
- ◆ Supports UNIX environments and Linux host environment, as well as Windows.
- ◆ Supports system test as well as stand-alone test.
- ◆ Many analysis functions such as to analyze coverage, memory leak, bottleneck, and run-time trace

VISION

[Manufacturer] Accurate Technologies, Inc. (ATI global headquarters)
[Distributor] ATI Japan
[Target devices] 78K0S, 78K0, 78K0R, 78K4, V850
[Features]

- ◆ Adaptation/integration measurement tool that conforms to ASAM standard and supports originally defined files
- ◆ Allowing adaptation test directly on Matlab/Simulink by organizing a seamless interface with Matlab/Simulink
- ◆ Also supports CCP/XCP.

Cantata++

[Manufacturer] IPL
[Distributor] A.I. Corporation
[Target device] V850
[Features]

Cantata++ is a stand-alone/integrated test supporting tool. It can substantially decreases the number of processes for software test by enhancing efficiency of stand-alone/integrated tests by providing a wizard function that automatically generates a code template for tests, supports generation of stub functions, automatically measures coverage, and generates a test template.

Coverage master winAMS

[Manufacturer/Distributor] GAIO TECHNOLOGY CO., LTD.
[Target devices] 78K0S, 78K0, 78K0R, V850
[Features]

- ◆ Environment automating single module (function) test of software
- ◆ Comprehensively executes single test to improve module quality.
- ◆ Automatically executes and judges I/O test of any module.
- ◆ Automatic coverage test for obtaining quantitative data of coverage rate of module test

PolySpace

[Manufacturer] PolySpace Technologies
[Distributor] A.I. Corporation
[Target device] V850
[Features]

PolySpace is a static analysis tool that automatically detects errors during execution which cause CPU hang-up and memory damage and are difficult to find. It can detect errors that result from dynamic behaviors which cannot be detected during compiling, through analysis using abstract interpretation theory. PolySpace can substantially improve software quality and test productivity.

CasePlayer2

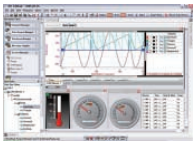
[Manufacturer/Distributor] GAIO TECHNOLOGY CO., LTD.
[Target devices] 78K0S, 78K0, 78K0R, V850
[Features]

- ◆ Analyzes source code in C and assembler to automatically create various documents such as flowcharts and variable lists.
- ◆ Visualizes information of source code to accurately analyze existing software resources in a short time.
- ◆ Can also clarify source code review in a short time.

CANLab

[Manufacturer] Accurate Technologies, Inc. (ATI global headquarters)
[Distributor] ATI Japan
[Target devices] 78K0S, 78K0, 78K0R, 78K4, V850
[Features]

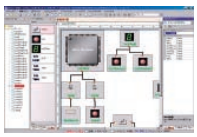
- ◆ CANLab is software for analyzing CAN and LIN which is as inexpensive as under 200,000 yen.
- ◆ Supporting industry's standard database, it offers various functions such as message transmission, trace, log, graph, path statistics, gage, and script.
- ◆ Annual maintenance cost is also as low as several ten-thousand yen, and CANLab is supplied in an environment where it is easy to increase the number of units.



No.1 system simulator

[Manufacturer/Distributor] GAIO TECHNOLOGY CO., LTD.
[Target devices] 78K0S, 78K0, 78K0R, V850
[Features]

- ◆ Next-generation simulation environment improves quality of embedded software
- ◆ Easily reproduces exception operations, interrupts, and timing events that are difficult to reproduce in verification using an actual machine, dramatically improving software quality
- ◆ Necessary simulation is automatically synthesized by only connecting model components on GUIs and thus can be organized in a short time.



Verification Tools (3/3)

CoMET/METeor/Metrix/PDB/VPM-T

simplex sigillum veri VaST™

[Manufacturer] VaST Systems Technology
[Distributor] Gaia System Solutions
[Target device] V850
[Features]
By using CoMET/METeor tool of VaST, creating virtual system prototype (VSP) from virtual processor model (VPM), bus model, and peripheral model, and enabling simulation of actual target software, including RTOS, on the VSP with guaranteed cycle accuracy. Solution of VaST allows analysis and optimization of architecture and parallel development of software and hardware, dramatically improving quality and lowering cost, and realizing Time to Market.

RAMScope (GT110: High-speed RAM monitor)

YOKOGAWA Yokogawa Digital Computer Corporation

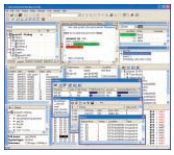
[Manufacturer/Distributor] Yokogawa Digital Computer Corporation
[Target device] V850
[Features]
- Monitors at high speeds the internal RAM data via NBD interface equipped to MCU
  128 points/1 ms max. Minimum time stamp: 10 μs
- Also simultaneously monitors and logs CAN message
- Many trigger functions and graphic display
- Supported microcontrollers: V850E/IA1, V850E/PG2 (as of July 2006)

Integrated Development Environments, Compilers (1/2)

EW78K/EWV850

IAR SYSTEMS

[Manufacturer] IAR Systems AB (Sweden)
[Distributor] IAR Systems K. K.
[Target devices] 78K0S, 78K0, 78K0R, V850
[Features]
- Full support of all devices of 78K0x/V850
- Integrates all tools in the same development environment (IDE) even with different types of targets
- Industry's top-level compiler that generates compact code
- Seamless coordination with ICEs of NEC Electronics
- Many header files, templates, and sample files



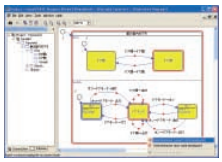
XASS-V Series

[Manufacturer/Distributor] GAIO TECHNOLOGY CO., LTD.
[Target devices] 78K0S, 78K0, 78K0R, V850
[Features]
- Supplies seamless integrated development environment
- Easy modifying and building of programs and starting debugger with editor, compiler, and assembler under the management of an integrated development environment
- Low-cost monthly rental available
- Supports ICEs and RTOSs of many manufacturers

visualSTATE

IAR SYSTEMS

[Manufacturer] IAR Systems AB (Sweden)
[Distributor] IAR Systems K. K.
[Target devices] 78K0S, 78K0, 78K0R, V850
[Features]
- Easy designing by state machine
- Many function test tools for improving reliability and decreasing the number of processes
- Dynamic formal verification tool
- Generates compact C/C++ codes independent of target device
- Automatically generating various documents



ProtoBuilder

[Manufacturer/Distributor] GAIO TECHNOLOGY CO., LTD.
[Target devices] 78K0S, 78K0, 78K0R, V850
[Features]
- Easy-to-operate product specification creation tool that does not require programming skill
- Smoothes communication between specification creator and software developer, so that "going back" of development because of insufficient specification can be eliminated
- Automatically creates specification based on status transition from a prototype model created.
- Read-only tool that can be distributed to other departments, cooperative companies, and foreign branch offices

IDE MULTI

ADOC

[Manufacturer] Green Hills Software, Inc. (USA)
[Distributor] Advanced Data Controls Corporation
[Target device] V850
[Features]
MULTI: Based on integrated GUI, Green Hills Software's MULTI provides a high-performance, easy-to-use integrated development environment. It provides a total support from programming to debugging and maintaining, helping shorten the development period and improve the performance and quality of the application program.
Compiler: IDE MULTI conforms to the ISO/ANSI C++ Standard. It also supports code generation by optimization peculiar to processor architecture so that pipeline processing suitable for a target processor and optimization related to instruction set can be performed.

C compiler for high-speed compact embedded systems exeGCC

KMC

[Manufacturer] Kyoto Microcomputer Co., Ltd.
[Distributors] Kyoto Microcomputer Co., Ltd.,
Naito Densei Machida Mfg. Co., Ltd.,
TESSERA Technology INC., NEC Micro Systems, Ltd.
[Target device] V850
[Features]
- Supports GNU C version 3.0.
- Supports C++. Also supplies EC++ library suitable for embedding.
- Porting optimized for Windows environment
- Original embedded library
- Supports Japanese. Comments and character strings in Japanese can be used.

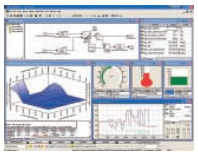
Integrated Development Environments, Compilers (2/2)

GNUPro

[Manufacturer/Distributor] Red Hat K. K.
[Target device] V850
[Features]
GNUPro contains a compiler, debugger including GUI front-end, linker, loader, utilities, and, depending on the target architecture, simulator (SID). GNUPro functions reinforced or extended by engineers of Redhat upon request from the customer are released after stringent test process.

No-Hooks

[Manufacturer] Accurate Technologies, Inc. (ATI global headquarters)
[Distributor] ATI Japan
[Target devices] 78K0S, 78K0, 78K0R, 78K4, V850
[Features]
- No-Hooks is the only bypass technique in the world which can change the functions of ECU without the need of modifying the source codes of ECU using the V850/78K.
- By using this software, output variables can be changed, and models created with Matlab/Simulink and programs created in C code can be easily added without having to go back to the source code. Creating a hook program is not necessary because the original source is not changed.



ZIPC

[Manufacturer/Distributor] CATS CO., LTD.
[Target devices] 78K0S, 78K0, 78K4, V850
[Features]
- Improves design quality by preventing “omission” or “missing” of combinations of events and statuses through design using a status transition table
- Behavior of software to be implemented can be dynamically verified (simulated) at design stage. Operation coordinated with virtual target can also be performed on PC.
- Automatically generates C codes conforming to ANSI C from the design paper. Design paper will be the final result.
- Supports efficient debugging of NEC's devices in coordination with a debugger

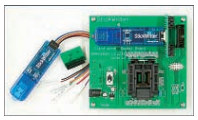
Flash Memory Programmers, PROM Writers (1/2)

AF9101 and AF9103 serial programmers

[Manufacturer/Distributor] Flash Support Group, Inc.
[Target devices] 78K0R, V850
[Features]
- Can be operated and written from a PC via a USB interface connection
- Enables standalone writing through simple key operation
- Supports GANG writing by using a dedicated PC application and controlling multiple units simultaneously
- Enables checking of information, such as checksum calculation, on the LCD mounted on the main body during standalone operation

StickWriter

[Manufacturer/Distributor] TESSERA Technology INC.
[Target devices] 78K0S, 78K0, 78K0R, V850
[Features]
- Writer for microcontroller with Flash of single power supply which enables development and mass production at any place
- Compact size directly connectable to USB connector
- Allows stand-alone writing by only supplying power to the target board
- Downloads HEX file of 1 MB as fast as 10 seconds
- Board with wiring for writing flash eliminating the need of wiring processing



Stick GANG Writer

[Manufacturer/Distributor] TESSERA Technology INC.
[Target devices] 78K0S, 78K0, 78K0R, V850
[Features]
- GANG-type writer using StickWriter as the write module
- Can save up to eight files into the internal flash memory
- Can support new devices by exchanging to dedicated adapter boards
- Enables standalone writing without using a PC
- Uses an AC adapter that supports 240 V AC and can be used outside of Japan

Full automatic programming system PH-220A

[Manufacturer/Distributor] Wave Technology Co., Ltd.
[Target devices] 78K0S, 78K0, 78K4, 78K0R, V850
[Features]
- PH-220A is a full automatic programming system with Y1100-8 which can simultaneously process eight PROMs.
- Supports open-top, lid-type sockets and equipped with a general-purpose tray loader to which 20 units can be set, this system can automatically write V850 and 78K.
- Many products are available as series, including full automatic programming system that can process 16/32 chips (with image teaching function), YAG laser marking system, and 3-dimensional lead inspecting system.

Flash Memory Programmers, PROM Writers (2/2)

Programming system Y1100-8

Wave Technology

[Manufacturer/Distributor] Wave Technology Co., Ltd.
[Target devices] 78K0S, 78K0, 78K4, 78K0R, V850
[Features]

- Gang programmer that can write and check eight chips at the same time
- Master data can be directly read from USB memory to internal memory.
- Master data can be saved to internal hard disk.
- Easy and comfortable operability of touch panel, PASS/FAIL indication supporting socket, checksum indication, and indication of the number of chips processed

NET IMPRESS series

YOKOGAWA
Yokogawa Digital Computer Corporation

[Manufacturer/Distributor] Yokogawa Digital Computer Corporation
[Target devices] 78K0S, 78K0, 78K4, 78K0R, V850
[Features]

- Enables programming with various manufacturers' microcontrollers (various programming specifications) with on-chip flash memory solder-mounted onto the user system
- General-purpose keys on one control module
- Able to operate via a host machine or as a stand-alone device
- Full lineup of software available as free downloads
- Stand-alone operation mode with high mobility

Flash microcontroller multi programmer ITF2000

[Manufacturer] INTERFACE Co., Ltd.
[Distributor] Naito Densei Machida Mfg. Co., Ltd.
[Target devices] 78K0S, 78K0, 78K0R
[Features]

- Available only in Japan
- Supports on-board writing and component writing
- Simultaneous writing of up to 10 flash microcontrollers
- Writing sequence can be edited.
- Easy-to-use remote control software as accessory

PG-FPL2K

Sunhayato

[Manufacturer] NEC Electronics Corporation
[Distributor] Sunhayato Corp.
[Target device] 78K0S
[Features]

- Flash programmer supporting “low pin count” series of All Flash 8-bit microcontrollers of NEC Electronics (78K0S/Kx1+)
- On-board writing
- Board with sample microcontroller mounted supplied as an accessory
- Program can be written from PC by USB connection.
- Control software and software for development can be downloaded without charge from an NEC Electronics Web site.

Data I/O Sprint Series (Optima)

[Manufacturer] Data I/O Corporation (USA)
[Distributor] Data I/O Corporation
[Target device] 78K0
[Features]

- Supports devices such as logic, memories, and microcontrollers
- Supports DIP, PLCC, TSOP, PGA, and QFP by option or conversion adapter
- Models for 1, 2, 4, and 8 sites available (Optima is shown in the photograph.)
- Low voltage
- DOS/Windows interface

FlashPRO V FL-PR5

NAITO DENSEI MACHIDA MFG. CO., LTD.

[Manufacturer/Distributor] Naito Densei Machida Mfg. Co., Ltd.
[Target devices] 78K0S, 78K0, 78K0R, 78K4, V850
[Features]

- Supports writing of all NEC Electronics microcontrollers with on-chip flash memories
- Provides a variety of code storage functions (up to eight types of codes and microcontroller information can be retained)
- Compact, space-saving, user-friendliness button layout
- Can support external automatic control thanks to standard command control support
- Supports a remote interface function that enables the operation and checking of writing and PASS/ERROR displays by using an external device

Programming system supporting FlashPAK networks

[Manufacturer] Data I/O Corporation (USA)
[Distributor] Data I/O Corporation
[Target device] 78K0
[Features]

- High-speed programmer optimized for large-capacity flash microcontrollers and memories
- Standalone operation via a CF card and control via the Ethernet. Includes job-editing PC software as standard.
- Large-size lever to enable simultaneous opening and closing of four sockets, and starting and stopping of writing by a single action, without requiring force
- Options supporting separate punching in of serial numbers and NAND bad blocks
- Wide-ranging support for devices and package types by various manufacturers

Emulators (1/2)

RTE-2000H-TP

[Manufacturer] Midas lab Inc.
[Distributors] CORE CORPORATION,
Naito Densei Machida Mfg. Co., Ltd.
[Target device] V850
[Features]
RTE-2000H-TP is a new model of JTAG connection method ICE that has units of function modules and realizes a high degree of freedom and expandability of component configuration as well as high speed and capacity.

- High-speed JTAG (up to 100 MHz)
- High-speed and high-capacity trace (up to 400 MHz and 144 Mb)
- High-capacity emulation memory (up to 128 MB)
- Low voltage support (up to 1.2 V)
- LAN/USB-IF (100 Mbps/480 Mbps)
- High-speed download probe

ETKS5

[Manufacturer] ETAS GmbH (Germany)
[Distributor] ETAS K. K.
[Target device] V850
[Features]

- Probe directly accessing memory of CPU via NBD
- Real-time emulation of CPU's internal ROM
- High-speed reading and rewriting of CPU's internal RAM (on-line operation)
- Data transfer rate between ETK and PC: 8/100 Mbps
- Operating temperature range: –40 to +110°C

RTE-V850x-IE series

[Manufacturer] Midas lab Inc.
[Distributors] CORE CORPORATION,
Naito Densei Machida Mfg. Co., Ltd.
[Target device] V850
[Features]
Full ICE series of in-circuit type emphasizing reduction in size and weight as dedicated emulator

- GHS's "MULTI" and Midas lab's "Partner" can be used as debuggers.
- Releases all resources of processor and supports all operation modes.
- Provided with emulation memory as standard
- Real-time execution and trace

In-circuit emulator ND series

[Manufacturer/Distributor] Naito Densei Machida Mfg. Co., Ltd.
[Target devices] 78K0S, 78K0, 78K4, V850
[Features]

- Available from distributor. Also available from Net shop ASMIS NET SHOP of Naito Densei Machida Mfg. Co., Ltd.
- High device equivalency by chip set dedicated to NEC Electronics emulator
- Low price (emulator + debugger as set)
- High-performance debugger supporting NEC Electronics integrated development environment

advicePLUS

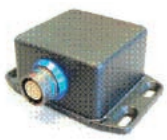
[Manufacturer/Distributor] Yokogawa Digital Computer Corporation
[Target device] V850
[Features]

- Option module support enables selection of only necessary functions
- Supports large-capacity emulation memory
- Supports a range of measuring functions
- Profile measuring, two-point execution time measuring, coverage measuring
- Supports trace analysis function of up to 32 K samples
- Supports N-Wire interface (OCD tool)
- Enables writing to external flash memory (OCD tool)
- Debugger: Supports microVIEW-PLUS

A7

[Manufacturer] Accurate Technologies, Inc. (ATI global headquarters)
[Distributor] ATI Japan
[Target devices] 78K0S, 78K0, 78K0R, 78K4, V850
[Features]

- PC interface between NBD and USB
- High-speed real-time adaptation realized by connecting VISION as memory emulator



advicePOCKET

[Manufacturer/Distributor] Yokogawa Digital Computer Corporation
[Target device] V850
[Features]

- Easy connection supporting N-Wire interface
- Power supply-less operation supporting USB Vbus (JTAG model)
- Can write external flash memory.
- Branch PC trace/data trace by N-Wire
- Debugger: microVIEW-PLUS dedicated to advicePOCKET supplied as standard
- Coordinated debugging by using external trigger cable

MJX330

[Manufacturer] Sumitomo Heavy Industries, Ltd.
[Distributor] Sumitomo Heavy Industries Mechatronics, Ltd.
[Target device] V850
[Features]

- "MJX330", a JTAG emulator of PC card type, excels in portability and can be used anywhere, from development site to field. It can be used in a wide range of phases from the initial stage of hardware development to integrated debugging.
  MJX330 also supports various debuggers of the third parties, so that it can supply a development environment suitable to your environment.

Emulators (2/2)

N-wire emulator PARTNER-Jet

[Manufacturer] Kyoto Microcomputer Co., Ltd.
[Distributors] Kyoto Microcomputer Co., Ltd.,
Naito Densei Machida Mfg. Co., Ltd.,
TESSERA Technology INC.,
NEC Micro Systems, Ltd.
[Target device] V850
[Features]

- Super high-speed download
- Host interface of all models supports USB2.0/1.1. Model30 also supports LAN (100Base-TX/10Base-T).
- High-capacity trace memory (up to 18 Mb, Model30)
- Supports high-speed trace clock (200 MHz)
- Option supporting high-capacity emulation memory (Model20/30): High capacity (4 MB to 64 MB), high access speed: 30 ns

TRACE32 type JTAG debugging tool

[Manufacturer] Lauterbach Datentechnik GmbH
[Distributor] Lauterbach Japan, Ltd.
[Target device] V850
[Features]

- TRACE32 has many debugging functions.
- Supports evaluation test to improve the performance of the target
- Trace data analysis tool and task-recognition type debugger supporting more than 20 types of RTOSs are equipped as standard.

DN-850 series

[Manufacturer/Distributor] BITRAN CORPORATION
[Target device] V850
[Features]

- Low-price emulator supporting N-Wire interface
- Supports CPUs and Nx85ET cores with the DCU (debug control unit) of the V850E1 or V850ES
- Supports LAN and USB as host interfaces as standard
- Supports compilers of various manufacturers, including NEC Electronics
- Supports writing to internal flash and external flash memory (400 model or above)

UniSTAC II

[Manufacturer/Distributor] Sophia Systems Co., Ltd.
[Target device] V850
[Features]

- Supports N-Wire interface. Provided with function for downloading to flash memory
- Hardware break settable. Software break (without limit) settable.
- Branch trace function (256 K steps)
- Debugger WATCHPOINT supporting C/C++ language supplied as standard
- Host connection with USB/LAN

TimeMachine, SuperTrace Probe

[Manufacturer] Green Hills Software, Inc.
[Distributor] Advanced Data Controls Corporation
[Target device] V850
[Features]
TimeMachine: Clarifies complicated problems of real-time interference with applications by reversely executing programs based on trace data. Realizes execution analysis, such as profiles, without extra codes for measurement.
SuperTrace Probe: Trace buffer of up to 1 GB that can completely collect data with a trace clock exceeding 300 MHz (only up to 160 MHz if IECUBE is used).
Can easily realize execution analysis of program subject to several 100 million or more of trace frames when used with TimeMachine.

Evaluation Boards, Starter Kits (1/3)

RTE-PC/CB series

[Manufacturer] Midas lab Inc.
[Distributors] CORE CORPORATION,
Naito Densei Machida Mfg. Co., Ltd.
[Target device] V850
[Features]

- Monitor support for MULTI from GHS and NEC Electronics' PARTNER
- High-speed program transfer via PC bus connection (except CB series)
- Connectable via serial communication (RS-232-C)

KBCR-CB2 image processing evaluation kit

[Manufacturer/Distributor] Shikino High-Tech CO., LTD.
[Target device] V850
[Features]

- Realizes flexible sensing processing unit by many image sensing functions and parametric functions
- High-speed compression processing by independent JPEG encode engine (30fps or more@VGA)
- Mainly consists of CPU, LAN, PCMCIA, and dedicated ASIC. External device can be easily connected because system bus and general-purpose port are output as extended buses.
- Real-time OS complies with μITRON4.0 specification and TCP/IP is implemented (uses MiSPO's NORTi)

Evaluation Boards, Starter Kits (2/3)

Giraffe

ミカサ商事株式会社

[Manufacturer/Distributor] MIKASA SHOJI CO., LTD.
[Target device] V850
[Features]

- Supports LAN, compact flash, and USB device for communication.
- Main board equipped with expansion connector, so that applications different from one user to another can be developed
- Option board that can select 5.5" color LCD board
- Option board NTSC video encoder/decoder and audio ADC/DAC supported
- Enables development focusing on audio/visual functions because of capability of A/V I/O

Mini microcontroller evaluation card (MODEL CT-207)

[Manufacturer/Distributor] Sunhayato Corp.
[Target device] 78K0S
[Features]

Sunhayato

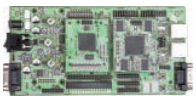
- Mini microcontroller evaluation card with switches and LEDs for evaluating the 78K0S/KA1+ microcontroller of NEC Electronics
- Programs can be written from a PC through a USB connection.
- Power supplied by USB bus
- Expandable by optional mini I/O card

GT200/201 series

YOKOGAWA
Yokogawa Digital Computer Corporation

[Manufacturer/Distributor] Yokogawa Digital Computer Corporation
[Target device] V850
[Features]

- Starter kit for evaluating next-generation automobile LAN FlexRay mounting V850E/IA1
- Robert Bosch GmbH's IP (FPGA version) as FlexRay controller
- Philips' FlexRay driver mounted on physical layer



ReferSTAR 78K (Model CT-780)

[Manufacturer/Distributor] Sunhayato Corp.
[Target device] 78K0S
[Features]

Sunhayato

- Equipped with 78K0S microcontroller (78K0S/KA1P CX) of NEC Electronics
- Development environment Applilet EZ PL that does not require any programming knowledge supplied as standard
- All hardware and software necessary for starting to learn as well as evaluating microcontrollers are mounted or supplied.
- Basic I/O devices, such as switch, LED indicator, 7-segment indicator, alarm, volume, and temperature sensor are mounted.
- Bread board that can be wired without soldering mounted
- Easy USB connection with PC

T-Engine development kit

[Manufacturer/Distributor] Personal Media Corporation
[Target device] V850
[Features]

PERSONAL MEDIA CORP.
www.personal-media.co.jp

- Packaged GNU-based development environment of CPU board meeting T-Engine specifications and real-time OS "PMC T-Kernel"
- Software environments necessary for program development for T-Engine supplied as standard
- Software specifications and detailed technical information on hardware, including circuit diagrams, are supplied as accessories
- Development kit of standard T-Engine and μT-Engine for various CPUs, including VR microcontrollers and V850 microcontrollers are available, so that selection can be made according to the use for development.

78K0 motor evaluation board

[Manufacturer/Distributor] GAIO TECHNOLOGY CO., LTD.
[Target device] 78K0
[Features]

GAIO TECHNOLOGY

- Motor control development that can be easily "started" and "tried"
- Motor control solution realized by 78K0
- Package of hardware platform and development software for controlling and developing the inverter of a DC motor
- Starter kit best suited for beginners of CPU control of DC motor

78K0S/KA1P CX

[Manufacturer] NEC Electronics Corporation
[Distributor] Sunhayato Corp.
[Target device] 78K0S
[Features]

Sunhayato

- Encapsulating μPD78F9222 of NEC Electronics' 8-bit microcontroller 78K0S/KA1+ in a 2.54 mm pitch 20-pin DIP package
- Universal board and bread board can be easily mounted without having to use a conversion board
- Best suited to evaluating the functions of the "low pin count" series of NEC Electronics' All Flash 8-bit microcontrollers
- Software for development can be downloaded without charge from an NEC Electronics Web site.

PE-PRO/V850IA4

[Manufacturer/Distributor] Myway labs Co., Ltd.
[Target device] V850
[Features]

Myway

- Enables quick and easy control and development of motors and power supplies using inverters
- Integrates functions designed for controlling power elements on one board
- Easy and convenient development and debugging control software

Evaluation Boards, Starter Kits (3/3)

V850USB stick

[Manufacturer] TANBAC Co.,Ltd.
[Distributor] Sunhayato Corp.
[Target device] V850
[Features]

- Ideal for CPU evaluation, starter kit, or learning when using the V850 for the first time
- Space-saving, USB memory size ideal for embedded systems
- When connected to a PC, data can be written from the PC to a flash memory (dedicated writer and self library not needed).
- Internal on-chip debugging function
- Usable when directly connected to USB port of a Windows-based PC
  (Much easier to use if software for TB0304 is installed)

Microcontroller evaluation kit (TK series)

[Manufacturer/Distributor] TESSERA Technology INC.
[Target devices] 78K0, V850
[Features]

- Easy-to-use, low-price kit for evaluating V850 and 78K0
- Can be used for research, education, and performance evaluation for mass production of your product
- Application-specific variations (Ethernet, ZigBee wireless) also available
- TK-Expansion Board that expands the function of the TK board and can perform applied operation is also available.

Support Information by Microcontroller Product (1/2)

Category	Product Name	Company Name	Supported Microcontrollers				
			78K0S	78K0	78K0R	78K4	V850
OSs, middleware, drivers	RTA product family (RTA-OSEK, RTA-COM, RTA-CAN)	ETAS K. K.	–	–	–	–	○
	IPNET	A.I. Corporation	–	–	–	–	○
	XTNDAccess Blue SDK	A.I. Corporation	–	–	–	–	○
	TOPPERS-Pro	A.I. Corporation	–	–	–	–	○
	eBoss Kernel	COMPUTER HI-TECH INC.	–	–	–	–	△
	H.264 encoder/decoder software	Techno Mathematical Co., Ltd.	–	–	–	–	○
	WMA decoder software	Techno Mathematical Co., Ltd.	–	–	–	–	○
	WMV9 decoder software	Techno Mathematical Co., Ltd.	–	–	–	–	○
	ENCIRQ™ Data Foundation™ Framework (ENCIRQ DFF)	Encirq Corporation	–	–	–	–	◎
	osCAN	Vector Japan Co., Ltd.	○	–	–	–	○
	CANbedded	Vector Japan Co., Ltd.	○	–	–	–	○
	OSVM™ Universe	Esmertec K. K.	◎	◎	◎	◎	◎
	Jbed™ Advanced	Esmertec K. K.	–	–	–	–	△
	Jbed™ CDC	Esmertec K. K.	–	–	–	–	△
	KASAGO IPv6-based development kit	Elmic Wescom, Inc.	△	△	△	△	○
	KASAGO TCP/IP (IPv4)-based development kit	Elmic Wescom, Inc.	△	△	△	△	○
	JAVA platform for embedded computing "JBlend"	Aplix Corporation	–	–	–	–	◎
	Puri-Puri MoPiD	Aplix Corporation	–	–	–	–	◎
	Embedded Browser "Esprit"	Websoft International Inc.	–	–	–	–	◎
	Embedded Flash Player	eSOL Co., Ltd.	–	–	–	–	○
	PictBridge SDK "PictDirect"	eSOL Co., Ltd.	–	–	–	–	△
	GRAPE USB solution products	Grape Systems Inc.	–	–	–	–	○
	ThreadX/ThreadX μITRON	Grape Systems Inc.	–	–	–	–	○
	Fusion series	Grape Systems Inc.	–	–	–	–	○
	DeepCore3.0+	E-Globaledge Corporation	–	–	–	–	△
	tresos ECU with OSEK plug-in	3SOFT Business Division, Elektrobit Nippon K. K.	–	△	–	–	△
	tresos ECU AUTOSAR suite	3SOFT Business Division, Elektrobit Nippon K. K.	–	–	–	–	○
	PMC T-Kernel	Personal Media Corporation	–	–	–	–	○
	PMC T-Shell development kit	Personal Media Corporation	–	–	–	–	△
	FlexRay communication software	Witz Inc.	–	–	–	–	◎
	Voice recognition middleware VORERO	Asahi KASEI Corparation	–	–	–	–	◎
	MatrixQuestUSB (USB host driver)	TEPCO UQUEST, LTD.	–	–	–	–	◎
	ubiquitous AV	Ubiquitous Corporation	–	–	–	–	◎
	ubiquitous SSL	Ubiquitous Corporation	–	–	–	–	◎
	ubiquitous TCP/IP	Ubiquitous Corporation	–	–	–	–	◎
	Voice recognition soft module LiteSpeech	Matsushita Electric Industrial Co., Ltd. Panasonic System Solutions Company Soft Module Group, Mobility Systems Head Office	–	–	–	–	○
Verification tools	RTA product family (RTA-TRACE)	ETAS K. K.	–	–	–	–	○
	INCA	ETAS K. K.	–	△	–	–	△
	IBM Rational TestRealTime	IBM Japan, Ltd.	△	△	△	△	◎
	Cantata++	A.I. Corporation	–	–	–	–	○
	PolySpace	A.I. Corporation	–	–	–	–	○
	CANLab	ATI Japan	○	○	○	○	○
	VISION	ATI Japan	○	○	○	○	○
	Coverage master winAMS	GAIO TECHNOLOGY CO., LTD.	○	○	△	–	○
	CasePlayer2	GAIO TECHNOLOGY CO., LTD.	○	○	△	–	○
	No.1 system simulator	GAIO TECHNOLOGY CO., LTD.	○	○	△	–	○
	CoMET/METeor/Metrix/PDB/VPM-T	VaST Systems Technology	–	–	–	–	○
	RAMScope (GT110: High-speed RAM monitor)	Yokogawa Digital Computer Corporation	–	–	–	–	△
Integrated development environments, compilers	EW78K/EWV850	IAR Systems K. K.	◎	◎	◎	–	◎
	visualSTATE	IAR Systems K. K.	◎	◎	◎	–	◎
	IDE MULTI	Advanced Data Controls Corporation	–	–	–	–	◎
	XASS-V Series	GAIO TECHNOLOGY CO., LTD.	○	○	△	–	○
	ProtoBuilder	GAIO TECHNOLOGY CO., LTD.	○	○	△	–	○
	C compiler for high-speed compact embedded systems exeGCC	Kyoto Microcomputer Co., Ltd.	–	–	–	–	○
	GNUPro	Red Hat K. K.	–	–	–	–	○
	ZIPC	CATS CO., LTD.	◎	◎	–	◎	◎
	No-Hooks	ATI Japan	△	△	△	△	○

Remark ◎: All products supported, ○: At least half of products supported, △: Less than half of products supported, –: Not supported

Support Information by Microcontroller Product (2/2)

Category	Product Name	Company Name	Supported Microcontrollers				
			78K0S	78K0	78K0R	78K4	V850
Flash memory programmers, PROM writers	AF9101 and AF9103 serial programmers	Flash Support Group, Inc.	–	–	◎	–	◎
	Stick GANG Writer	TESSERA Technology INC.	◎	◎	◎	–	◎
	StickWriter	TESSERA Technology INC.	○	○	○	–	○
	Full automatic programming system PH-220A	Wave Technology Co., Ltd.	△	○	–	△	△
	Programming system Y1100-8	Wave Technology Co., Ltd.	△	○	–	△	△
	Flash microcontroller multi programmer ITF2000	INTERFACE Co., Ltd.	○	○	–	–	–
	DataI/O Sprint Series(Optima)	Data I/O Corporation	–	△	–	–	–
	Programming system supporting FlashPAK networks	Data I/O Corporation	–	◎	–	–	–
	NET IMPRESS series	Yokogawa Digital Computer Corporation	△	○	–	△	○
	PG-FPL2K	Sunhayato Corp.	◎	–	–	–	–
	FlashPRO V FL-PR5	Naito Densei Machida Mfg. Co., Ltd.	○	○	○	○	○
Emulators	RTE-2000H-TP	Midas lab Inc.	–	–	–	–	○
	RTE-V850x-IE series	Midas lab Inc.	–	–	–	–	○
	advicePLUS	Yokogawa Digital Computer Corporation	–	–	–	–	○
	advicePOCKET	Yokogawa Digital Computer Corporation	–	–	–	–	○
	ETKS5	ETAS K. K.	–	–	–	–	△
	In-circuit emulator ND series	Naito Densei Machida Mfg. Co., Ltd.	○	○	–	○	○
	A7	ATI Japan	△	△	△	△	○
	MJX330	Sumitomo Heavy Industries Mechatronics, Ltd.	–	–	–	–	△
	N-wire emulator PARTNER-Jet	Kyoto Microcomputer Co., Ltd.	–	–	–	–	○
	DN-850 series	BITRAN CORPORATION	–	–	–	–	△
	Time Machine SuperTrace Probe	Advanced Data Controls Corporation	–	–	–	–	○
	TRACE32 type JTAG debugging tool	Lauterbach Japan, Ltd.	–	–	–	–	○
	UniSTAC II	Sophia Systems Co., Ltd.	–	–	–	–	○
Evaluation boards, starter kits	RTE-PC/CB series	Midas lab Inc.	–	–	–	–	△
	KBCR-CB2 image processing evaluation kit	Shikino High-Tech CO., LTD.	–	–	–	–	△
	Giraffe	MIKASA SHOJI CO., LTD.	–	–	–	–	△
	GT200/201 series	Yokogawa Digital Computer Corporation	–	–	–	–	△
	T-Engine development kit	Personal Media Corporation	–	–	–	–	○
	78K0S/KA1P CX	Sunhayato Corp.	△	–	–	–	–
	Mini microcontroller evaluation card (MODEL CT-207)	Sunhayato Corp.	△	–	–	–	–
	ReferSTAR 78K (Model CT-780)	Sunhayato Corp.	△	–	–	–	–
	78K0 motor evaluation board	GAIO TECHNOLOGY CO., LTD.	–	○	–	–	–
	PE-PRO/V850IA4	Myway labs Co., Ltd.	–	–	–	–	△
	V850USB stick	TANBAC Co.,Ltd.	–	–	–	–	△
	Microcontroller evaluation kit (TK series)	TESSERA Technology INC.	–	△	–	–	△

Remark ◎: All products supported, ○: At least half of products supported, △: Less than half of products supported, –: Not supported

Partner Contact Information - Support in Japan (1/3)

Contact		TEL	FAX
IAR Systems Company E-mail: info@iarsys.co.jp URL: http://www.iarsys.co.jp		81-3-5298-4800	81-3-5298-4801
E-Globaledge Corporation E-mail: business-link@e-globaledge.com URL: http://linkevolution.e-globaledge.com/		81-3-6412-6023	81-3-6412-6016
Advanced Data Controls Corporation E-mail: sales@adac.co.jp URL: http://www.adac.co.jp/		81-3-3576-5351	81-3-3576-1772
Asahi KASEI Corporation E-mail: vorero_sales@om.asahi-kasei.co.jp URL: http://www.asahi-kasei.co.jp/vorero/jp/		81-46-230-4900	81-46-230-4910
TESSERA Technology INC. E-mail: support@tessera.co.jp URL: http://www.tessera.co.jp/		81-44-271-7533	81-44-271-7534
Aplix Corporation E-mail: www.aplix.co.jp/jp/contact/general/index.html URL: http://www.aplix.co.jp/		81-3-3207-6575	81-3-3204-6450
eSOL Co., Ltd. E-mail: ep-info@esol.co.jp		81-3-5302-1360	81-3-5302-1361
flashinfo@esol.co.jp (Flash Player) URL: http://www.esol.co.jp/	Flash Player	81-3-5365-1280	81-3-5365-1281
ETAS K. K. E-mail: sales@etas.co.jp URL: http://jp.etasgroup.com/		81-45-222-0900	81-45-222-0956
INTERFACE Co,. Ltd. E-mail: sales@itf.co.jp URL: http://www.itf.co.jp/		81-42-528-8651	81-42-528-8678
VaST Systems Technology E-mail: info-jp@vastsystems.com URL: http://www.vastsystems.com/jp/index.html		81-3-6717-2810	81-3-6717-4545
Witz Inc. E-mail: webmaster@witz-inc.co.jp URL: http://www.witz-inc.co.jp/		81-52-223-7570	81-52-223-7580
Websoft International Inc. E-mail: support@wsoft.co.jp URL: http://www.wsoft.co.jp/		81-3-3555-3771	81-3-3555-3772
Wave Technology Co., Ltd. E-mail: sales@y1000.com URL: http://www.y1000.com/		81-3-5304-1885	81-3-5304-1886
A.I. Corporation E-mail: sales@aicp.co.jp URL: http://www.aicp.co.jp/		81-3-3493-7981	81-3-3493-7993
Esmertec K. K. E-mail: info@esmertec.co.jp URL: http://www.esmertec.co.jp/		81-3-5456-5654 (Representative)	81-3-3496-1011
ATI Japan E-mail: kokubo@accuratetechnologies.com URL: http://www.accuratetechnologies.com/		81-3-5325-6222	81-3-5325-6223
Elmic Wescom, Inc. E-mail: info@elwsc.co.jp URL: http://www.elwsc.co.jp/		81-120-045-690 81-45-664-5171	81-45-650-1021
3SOFT Business Division, Elektrobit Nippon K. K. E-mail: info-jp@3SOFT.de URL: http://www.elektrobit.jp/3soft/		81-3-5775-6160	81-3-5775-6161
Encirq Corporation E-mail: marketing@encirq.co.jp URL: http://www.encirq.co.jp/		81-3-5420-7166	81-3-5420-7382
GAIO TECHNOLOGY CO., LTD. E-mail: info@gaio.co.jp URL: http://www.gaio.co.jp/		81-3-3662-3041	81-3-3662-3043

Partner Contact Information - Support in Japan (2/3)

Contact		TEL	FAX
CATS CO.,LTD. E-mail: info@zipc.com URL: http://www.zipc.com/		81-45-473-2816	81-45-473-2673
Kyoto Microcomputer Co., Ltd. E-mail: jp-info@kmckk.co.jp URL: http://www.kmckk.co.jp/	Head office	81-75-335-1050	81-75-335-1051
	Tokyo office	81-3-5157-4530	81-3-5157-4531
Grape Systems Inc. E-mail: sales@info.grape.co.jp URL: http://www.grape.co.jp/		81-45-222-3761	81-45-222-3760
C-ICE Sales Division, CORE CORPORATION E-mail: sales@core.co.jp URL: http://www.core.co.jp/		81-3-3795-5171	81-3-3795-5170
COMPUTER HI-TECH INC. E-mail: eboss@cht.co.jp URL: http://www.cht.co.jp/chtcom/html/index.html		81-3-3839-9806	81-3-3839-5432
Sunhayato Corp. E-mail: info@sunhayato.co.jp URL: http://www.sunhayato.co.jp/		81-3-3984-7791	81-3-3971-0535
Shikino High-Tech CO., LTD. E-mail: sales@shikino.co.jp URL: http://www.shikino.co.jp/		81-6-6221-0850	81-6-6221-0859
Sumitomo Heavy Industries Mechatronics, Ltd. E-mail: https://shiweb01.shi.co.jp/shiweb01/WebRequest.ns4/j-shimechatronicsjp?OpenForm URL: http://www.shi.co.jp/smec/		81-3-3392-3331	81-3-3393-3878
Marketing Group, Planning Division, Sophia Systems Co., Ltd. E-mail: market@sophia-systems.co.jp URL: http://www.sophia-systems.co.jp/		81-44-989-7253	81-44-989-7014
TANBAC Co., Ltd. E-mail: info@tanbac.co.jp URL: http://www.tanbac.co.jp/top.html		81-3-5603-2051	81-3-5603-2055
Techno Mathematical Co., Ltd. E-mail: info@tmath.co.jp URL: http://www.tmath.co.jp/		81-3-5798-3636	81-3-5798-0226
TEPCO UQUEST, LTD. E-mail: sales@uquest.co.jp URL: http://www.uquest.co.jp		81-3-3580-5501	81-3-3580-5509
TOYO Corporation E-mail: sdp@toyo.co.jp URL: http://www.toyo.co.jp/sdp/		81-3-3279-0771	81-3-3246-0645
Naito Densei Machida Mfg. Co., Ltd. E-mail: info@ndk-m.co.jp URL: http://www.ndk-m.co.jp/asmis/		81-42-750-4172	81-42-750-4183
IBM Japan, Ltd. E-mail: https://www-06.ibm.com/jp/domino03/software/ecatalog.nsf/qu1?OpenForm URL: http://www-06.ibm.com/jp/software/rational/		81-120-450-260	–
Lauterbach Japan, Ltd. E-mail: info@lauterbach.co.jp URL: http://www.lauterbach.co.jp/		81-34-477-4511	81-34-477-4519
Personal Media Corporation E-mail: te-sales@personal-media.co.jp URL: http://www.personal-media.co.jp/te		81-3-5475-2185	81-3-5475-2186
ICE Division, BITRAN CORPORATION E-mail: ice-sales@bitran.co.jp URL: http://www.bitran.co.jp/ice/		81-48-556-9881	81-48-556-9591
Flash Support Group,Inc. E-mail: sales@j-fsg.co.jp URL: http://www.j-fsg.co.jp/		81-53-428-8380	81-53-428-8377

Partner Contact Information - Support in Japan (3/3)

Contact	TEL	FAX
Vector Japan Co., Ltd. (Representative) E-mail: info@vector-japan.co.jp URL: http://www.vector-japan.co.jp/	81-3-5769-6970	81-3-5769-6975
Vector Japan Co., Ltd. (CANapeGraph) E-mail: CANape@vector-japan.co.jp1	81-3-5769-6970	
Vector Japan Co., Ltd. (CANoe/DENoe, CANscope) E-mail: Tool@vector-japan.co.jp	81-3-5769-6971	
Vector Japan Co., Ltd. (osCAN, CANbedded) E-mail: eng@vector-japan.co.jp	81-3-5769-6972	
Vector Japan Co., Ltd. (Embedded solutions for CANopen devices) E-mail: CANopen@vector-japan.co.jp	81-3-5769-6974	
Myway labs Co.,Ltd. E-mail: sales@myway-labs.co.jp URL: http://www.myway-labs.co.jp/	81-45-476-3722	81-45-476-3723
Midas lab Inc. E-mail: support@midas.co.jp URL: http://www.midas.co.jp	81-3-3357-2589	81-3-3357-8029
Matsusita Electric Industrial Co.,Ltd. Panasonic System Solutions Company Soft Module Group, Mobility Systems Head Office E-mail: Inquire from the Web site URL. URL: http://panasonic.biz/smg/	81-6-6866-8087	81-6-6866-8761
Sales Engineering Division, MIKASA SHOJI CO., LTD. E-mail: info-d1@mikasa.co.jp URL: http://www.mikasa.jp/	81-6-6946-3773	81-6-6946-3753
Ubiquitous Corporation E-mail: info@ubiquitous.co.jp URL: http://www.ubiquitous.co.jp/	81-3-5908-3451	81-3-5908-3452
Yokogawa Digital Computer Corporation, advicePLUS/advicePOCKET E-mail: info-advice@yokogawa-digital.com URL: http://www.yokogawa-digital.com/	81-42-333-6222	81-42-352-6107
Yokogawa Digital Computer Corporation, NET IMPRESS Series E-mail: info-impress@yokogawa-digital.com URL: http://www.yokogawa-digital.com/	81-42-333-6224	81-42-352-6109
Yokogawa Digital Computer Corporation, RAMScope, GT200/201 series E-mail: info-mvi@yokogawa-digital.com URL: http://www.yokogawa-digital.com/	81-42-333-6239	81-42-352-6106
Red Hat K. K. E-mail: embedded-jp@redhat.com URL: http://www.jp.redhat.com/	81-3-6406-9900	81-3-6406-9901

Partner Contact Information - Support Outside of Japan (1/4)

Company name (Japanese)	Area	Company name (spot)	TEL	FAX
Accelerated Technology Japan Embedded Systems Division of Mentor Graphics Japan Co., Ltd.	Worldwide	Accelerated Technology, Embedded Systems Division of Mentor Graphics info@acceleratedtechnology.com http://www.acceleratedtechnology.com/ATI/contact.php http://www.mentor.com/embedded	1-251-208-3400 Toll-free: 800-468-6853 (US only)	1-251-208-7074
Advanced Data Controls Corp.	Japan, Asia	Advanced Data Controls Corp. sales@adac.co.jp http://www.adac.co.jp	81-3-3576-5351	81-3-3576-1772
	U.S.A.	Green Hills Software, Inc. sales@ghs.com http://www.ghs.com	1-805-965-6044	1-805-965-6343
	Europe	http://www.ghs.com		
AI Corporation	Worldwide	AI Corporation sales@aicp.co.jp	81-3-3493-7981	81-3-3493-7993
Aplix Corporation	Americas	Aplix Corporation of America www.aplix.co.jp/en/contact/general/index.html http://www.aplix.co.jp/	1-415-558-8800	1-415-558-8822
	Europe, Middle East, Africa	Aplix Europe GmbH www.aplix.co.jp/en/contact/general/index.html http://www.aplix.co.jp/	49-89-2420759-0	49-89-2420759-5
	Asia Pacific	iaSolution Inc.index.html www.aplix.co.jp/en/contact/general/ http://www.aplix.co.jp/, www.iasolution.net/	886-2-2776-1680	886-2-2776-1380
Asahi Kasei Corporation	Worldwide	Asahi Kasei Corporation http://www.asahi-kasei.co.jp/vorero/en/contact/index.html http://www.asahi-kasei.co.jp/vorero/en/index.html		
ATI Japan	Worldwide	Accurate Technologies Inc. http://www.accuratetechnologies.com/worldwide.html http://www.accuratetechnologies.com/		
COMPUTER HI-TECH INC.	Worldwide	COMPUTER HI-TECH INC. eboss@cht.co.jp http://eboss.cht.co.jp		
E-Globaledge Corporation	North America, Asia	E-Globaledge Corporation k-sakata@e-globaledge.com http://www.e-globaledge.com/english/index.html		
Elektrobit Nippon K.K. 3SOFT Business Division	Worldwide	3SOFT GmbH info@3SOFT.de http://www.3soft.de/		
Encirq Corporation	Worldwide	Encirq Corporation http://www.encirq.com/company/contact_us/contact.asp http://www.encirq.com/index.html		
Esmertec Inc.	Worldwide	Esmertec Inc. http://www.esmertec.com/company/offices.shtml http://www.esmertec.com/		
eSOL Co., Ltd.	Worldwide	eSOL Co., Ltd. ep-info@esol.co.jp http://www.esol.co.jp/english/embedded	+81 3-5302-1360	81-3-5302-1361
ETAS Inc.	Worldwide	ETAS Inc. http://en.etasgroup.com/about/world_offices.shtml http://en.etasgroup.com/index.shtml		
Flash Support Group, Inc.	Worldwide	Flash Support Group, Inc. http://www.j-fsg.co.jp/e/form_ask01.html http://www.j-fsg.co.jp/en/index.html		
GAIO TECHNOLOGY CO., LTD.	Worldwide	GAIO TECHNOLOGY CO., LTD. info@gaio.co.jp http://www.gaio.com/	81-3-3662-3041	81-3-3662-3043

Partner Contact Information - Support Outside of Japan (2/4)

Company name (Japanese)	Area	Company name (spot)	TEL	FAX
Grape Systems	Japan	Grape Systems Inc.	81-45-323-6541	81-45-323-6546
	All over the world	Express Logic, Inc info@expresslogic.com http://www.expresslogic.com	1-858-613-6640	1-858-613-6646
IAR Systems	Sweden	IAR Systems AB info@iar.se http://www.iar.com	46-18-16-78-00	46-18-16-78-38
	USA (West)	IAR Systems Software Inc. info@iar.com http://www.iar.com	1-650-287-4250	1-650-287-4253
	USA (East)	IAR Systems Software Inc. info@iar.com http://www.iar.com	1-508-485-2692	1-508-485-9126
	China	IAR Systems AB info@iar.se http://www.iar.com	86-21-6267-0236	86-21-6267-5980
	United Kingdom	IAR Systems Ltd. info@iarsys.co.uk http://www.iar.com	44-0-1604-250-440	44-0-1604-250-330
	Germany	IAR Systems AG info@iar.de http://www.iar.com	49-89-88-98-90-0	49-89-88-98-90-90
	Belgium	IAR Systems AB info@iar.se http://www.iar.com	32-2-401-87-89	32-2-401-68-68
	Denmark	IAR Systems A/S info@iar.dk http://www.iar.com	45-8734-1100	45-8734-1190
	Brazil	IAR Systems Software Inc. info@iar.com http://www.iar.com	55-19-3251-1763	55-19-3251-1763
IBM Japan, Ltd.	Japan	IBM Japan, Ltd.	81-3-5642-9100	81-3-5642-9120
	All over the world	International Business Machines Corporation ratlinfo@us.ibm.com http://www.rational.com/products/testrt	1-800-728-1212	1-781-676-2410
Kyoto Microcomputer Co., Ltd.	Worldwide	en-info@kmckk.co.jp http://www.kmckk.co.jp/eng/index.html	075-335-1050	075-335-1051
Lauterbach Japan, Ltd.	Worldwide	Lauterbach Datentechnik GmbH http://www.lauterbach.de/frames.html?dindex.html		
Midas lab. Inc.	United States, Europe, Asia	Midas lab. Inc support@midas.co.jp http://www.midas.co.jp/download/english/manual.htm	81-3-3357-2589	81-3-3357-8029
MIKASA SHOJI Co.,Ltd.	Worldwide	info-d1@mikasa.co.jp http://www.mikasa.jp/	81-6-6946-3773	81-6-6946-3753
Myway Labs Co., Ltd.	Japan	Myway Labs Co., Ltd. sales@myway-labs.co.jp http://www.myway-labs.co.jp/English/index.html	81-45-476-3722	81-45-476-3723
	China	Myway Electronic Technology (Shanghai) Co., Ltd. xiaoyuan@myway-labs.co.jp http://www.myway-labs.co.jp/English/index.html	86-21-5896-8550	86-21-5896-8551
Naito Densei Machida Seisakusho	Japan	Naito Densei Machida Mfg. Co., Ltd.	–	81-45-475-4091
Personal Media Corporation	Worldwide	Personal Media Corporation te-sales@personal-media.co.jp http://www.t-engine4u.com/	–	81-3-5475-2186
Red Hat, Inc.	Worldwide	Red Had, Inc. http://www.redhat.com/	1-919-754-3700	1-919-754-3701

Partner Contact Information - Support Outside of Japan (3/4)

Company name (Japanese)	Area	Company name (spot)	TEL	FAX
Sophia Systems Co. Ltd.	United States, Canada	Enable Engineering Co., Inc sales@eecosales.com	1-650-375-0409	1-650-375-8666
	Israel	Sightsys dani@sightsys.co.il http://www.sightsys.co.il	972-3-922-2771	972-3-922-2059
	United Kingdom	Direct Insight sales@directinsight.co.uk http://www.directinsight.co.uk	44-0-1280-700262	44-0-1280-700577
	France	Antycip akkouche@antycip.com http://www.antycip.com	33-1-39-61-14-14	33-1-30-76-29-73
	Eastern Europe	Eastern Trade Embedded Systems Trading and Consulting info@easterntrade.de http://www.easterntrade.de	49-0-8233-78-09-26	49-0-8233-78-09-27
	Singapore, Malaysia	FLASH Technology flashsgp@pacific.net.sg http://www.flashtech.com.sg	065-6749-6168	065-6749-6138
	Taiwan	SuperLink Technology sulin@superlink.com.tw http://www.superlink.com.tw	886-2-2698-3456	886-2-2698-3535
	India	Trident Infosol rameshwarbandi@vsnl.net http://www.tridentinfosol.com	91-80-2224-5037	91-80-2229-1566
	China, Hong Kong	Emdoor Electronic & Technology Co, Ltd. info@emdoor.com http://www.emdoor.com	Shenzhen Office (HQ) 86-755-83474893, 86-755-83474896, 86-755-83474892	Shenzhen Office (HQ) 86-755-83474895
			Beijing Office 86-10-62376767, 86-10-62375506	Beijing Office 86-10-62376767
			Shanghai Office 86-21-62650520, 86-21-62643621	Shanghai Office 86-21-62650520
			Hong Kong Office 852-25780383	—
	Korea	MDS Technology hyungkwan@hkmds.com http://www.mdstec.com	82-2-2106-6000	82-2-2106-6004
Sunhayato Corp.	Worldwide	Sunhayato Corp. info@sunhayato.co.jp http://www.sunhayato.co.jp/index.php	81-3-3984-7791 (main)	81-3-3971-0535
Techno Mathematical Co., LTD	Worldwide	Techno Mathematical Co., LTD info@tmath.co.jp http://www.tmath.co.jp/eng/index_e.html	81-3-5798-3636	81-3-5798-0226
TEPCO UQUEST, LTD.	Worldwide	TEPCO UQUEST, LTD. sales@uquest.co.jp http://www.uquest.co.jp/en/		
TESSERA Technology INC.	U.S.A., Europe, Asia	TESSERA Technology INC. support@tessera.co.jp http://www.tessera.co.jp/		
Ubiquitous Corporation	North America, Europe, Asia	Ubiquitous Corporation info@ubiquitous.co.jp http://www.ubiquitous.co.jp/En/	81-3-5908-3451	81-3-5908-3452
Data I/O Corporation	Worldwide	Data I/O Corporation http://www.dataio.com/contact/ http://www.dataio.com/		
VaST Systems Technology	Worldwide	VaST Systems Technology http://www.vastsystems.com/contact.html http://www.vastsystems.com/		

Partner Contact Information - Support Outside of Japan (4/4)

Company name (Japanese)	Area	Company name (spot)	TEL	FAX
Vector Japan	Germany	Vector Informatik sales@vector-informatik.com http://www.vector-informatik.de	49-711-80670-0	49-711-80670-111
	USA	Vector CANtech sales@vector-cantech.com http://www.vector-cantech.com	1-248-449-9290	1-248-449-9704
	Japan	Vector Japan sales@vector-japan.co.jp http://www.vector-japan.co.jp	81-3-5769-6980	81-3-5769-6975
	France	Vector France information@vector-france.com http://www.vector-france.com	33-1-4231-4000	33-1-4231-4009
	Sweden	Vector Scandinavia sales@vecscan.com http://www.vecscan.com	46-31-83-40-80	46-31-83-40-99
Wave Technology Co., Ltd.	All over the world	http://www.y1000.com/en/	81-3-5304-1885	81-3-5304-1886
Websoft International Inc.	Worldwide	Websoft International Inc. http://www.wsoft.co.jp/english/feedback/ http://www.wsoft.co.jp/english/index.html		
Witz Corporation	Worldwide	Witz Corporation users-support@witz-inc.co.jp http://www.witz-inc.co.jp/	81-52-223-7570	81-52-218-5855
Yokogawa Digital Computer Corporation	U.S.A.	Yokogawa Corporation of America		
		[Pacific Time Zone] shotaro.saito@us.yokogawa.com	1-408-392-1364	1-408-392-0541
		[Eastern Time Zone] bob.timms@us.yokogawa.com	1-770-594-0399, Ext. 5126	1-770-594-0336
		http://www.advice-PLUS.com/		
	Germany	Hitex Development Tools GmbH info@hitex.de http://www.hitex.de/	49-721-9628-0	49-721-9628-149
	Europe	Ashling Microsystems Limited advice@ashling.com http://www.ashling.com/	44-1256-811998	44-1256-811761
	Korea	KM Data Inc. kmdata@kmd.co.kr http://www.kmdata.co.kr/	82-2-3281-0333	82-2-3281-3117
	China	Yokogawa Shanghai Trading Co., Ltd. meng_fanpu@ysh.com.cn http://www.yokogawa.com/cn-ysh/	86-10-6588-3555	86-10-6588-7025
	Singapore	Unidux Electronics Limited sales@unidux.com.sg http://www.unidux.com.sg/	65-6569-3611	65-6566-9271
	Other countries	Yokogawa Digital Computer Corporation info-ovs@yokogawa-digital.com http://www.yokogawa-digital.com/en/	81-42-333-6222	81-42-333-6107

Rental Companies

The above tools (hardware only) are leased out by the following companies. Please contact these companies for further details.

Contact	URL
Orix Rentec	http://www.orixrentec.co.jp
Showa High-Tec Rent	http://www.shiret.co.jp
Yokogawa Rent-A-Lease	http://www.yrl.com

SUPPORT SYSTEM

Purchasing Products

Please contact an NEC Electronics distributor or sales representative regarding the purchase of NEC Electronics products. Customers will receive shipment of products after the distributor or NEC Electronics sales office has submitted their order form.

Note that a precontract is required for real-time OS and middleware (RX-NET, RX-FS, GOFAST) products to be embedded in the customer's system. The procedure for purchasing NEC Electronics products is outlined below.

Purchasing procedure for products requiring precontract

Preparation of purchase order form	A precontract is required when purchasing real-time OS products. Customers are therefore requested to fill out a purchase order form and submit it to an NEC Electronics sales representative.
About 1 week ↓	
Signing of contract	A contract will be ready for signing about 1 week following submission of the order form. Please confirm that the contents are correct before signing the contract.
↓	
Submission of order	After the contract has been signed, the NEC Electronics sales division will submit the order form.
About 2 weeks ↓	
Product shipment	NEC Electronics operates on a production-on-demand system, so customers should expect shipment about 2 weeks after their order is received.

Supply format

Software from NEC Electronics includes only those objects necessary for operation. In the case of real-time OS and middleware products, however, due to the nature of the software, source code is supplied along with the execution objects.

After-sales support

Free upgrades
Provided the customer has completed and returned the User Registration Card included with the product's guarantee card, free upgrades are available online for the period of one-year following purchase. Once this period expires, an upgrade fee will be required.

Inquiries regarding product usage and bugs
Please direct any inquiries to an NEC Electronics distributor, sales division, or use the technical hotline.

Range of support
NEC Electronics provides support for all products that have been used in accordance with the stated methods. Note that real-time OS source code products fall outside NEC Electronics' support range.

Seminars

NEC Electronics provides a wide variety of forums for exploring the microcontroller development environment, ranging from seminars to introduce potential new customers to NEC Electronics products, to training sessions for those customers seeking to improve their knowledge and technical skills. All those interested are warmly invited to attend.

The following seminars have been organized to assist customers in understanding and using the V850 microcontroller development environment.

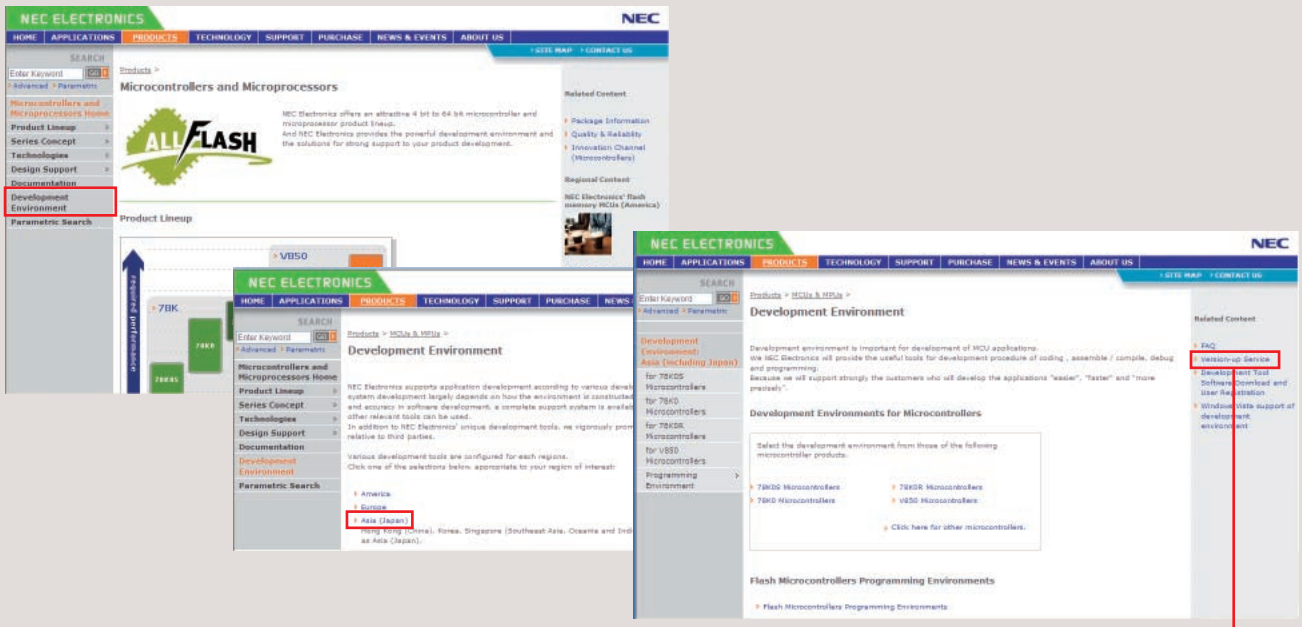
To find out more about these seminars, please refer to the seminar Web site (http://www.necel.com/seminar). Those interested in NEC Electronics' "on-site seminars" held at the customer's location are requested to contact an NEC Electronics for details such as date and content.

DEVELOPMENT TOOLS DOWNLOAD SERVICE

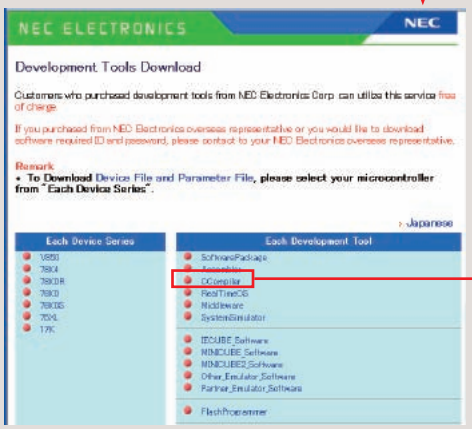
Service Outline

1. Development tool software for the 78K and V850 microcontrollers can be downloaded.
2. Technical information (version, technical documentation, etc.) pertaining to development tool software for the 78K and V850 microcontrollers can be viewed.
3. Version upgrade information is distributed by e-mail to registered users.

The ODS top screen can be jumped to from the NEC Electronics Microcontroller website
(http://www.necel.com/micro/en/index.html)
by clicking [Development Environment].
(Refer to above figure.)

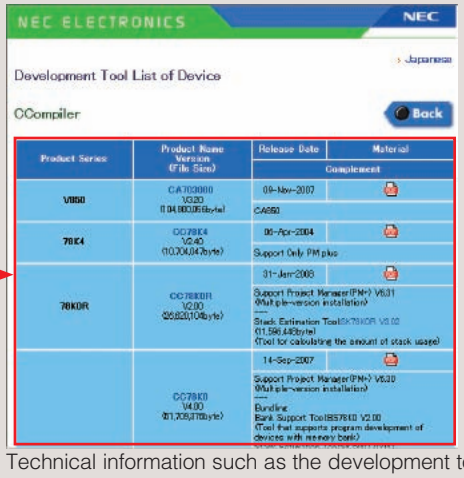


Download service top screen



The sought after development tool can be looked for by device series or by development tool.

Screen when C Compiler has been selected



Technical information such as the development tool software version, release date, size, and attached documents can be viewed (example: CA703000).

MEMO

NEC Electronics Microcontroller website: http://www.necel.com/micro/index_e.html

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JBlend and microJBlend are trademarks of Aplix Corporation.
GNUPro is a registered trademark of Red Hat, Inc.
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  The "Specific" quality grade applies only to NEC Electronics products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of an NEC Electronics product depend on its quality grade, as indicated below. Customers must check the quality grade of each NEC Electronics product before using it in a particular application.

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  "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support).

  "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC Electronics products is "Standard" unless otherwise expressly specified in NEC Electronics data sheets or data books, etc. If customers wish to use NEC Electronics products in applications not intended by NEC Electronics, they must contact an NEC Electronics sales representative in advance to determine NEC Electronics' willingness to support a given application.

(Note)

(1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.

(2) "NEC Electronics products" means any product developed or manufactured by or for NEC Electronics (as defined above).

M8E 02. 11-1

For further information, please contact:

NEC Electronics Corporation
1753, Shimonumabe, Nakahara-ku,
Kawasaki, Kanagawa 211-8668,
Japan
Tel: 044-435-5111
http://www.necel.com/

[America]

NEC Electronics America, Inc.
2880 Scott Blvd.
Santa Clara, CA 95050-2554, U.S.A.
Tel: 408-588-6000
800-366-9782
http://www.am.necel.com/

[Europe]

NEC Electronics (Europe) GmbH
Arcadiastrasse 10
40472 Düsseldorf, Germany
Tel: 0211-65030
http://www.eu.necel.com/

Hanover Office
Podbielskistrasse 166 B
30177 Hannover
Tel: 0 511 33 40 2-0

Munich Office
Werner-Eckert-Strasse 9
81829 München
Tel: 0 89 92 10 03-0

Stuttgart Office
Industriestrasse 3
70565 Stuttgart
Tel: 0 711 99 01 0-0

United Kingdom Branch
Cygnus House, Sunrise Parkway
Linford Wood, Milton Keynes
MK14 6NP, U.K.
Tel: 01908-691-133

Succursale Française
9, rue Paul Dautier, B.P. 52
78142 Velizy-Villacoublay Cédex
France
Tel: 01-3067-5800

Sucursal en España
Juan Esplandiu, 15
28007 Madrid, Spain
Tel: 091-504-2787

Tyskland Filial
Täby Centrum
Entrance S (7th floor)
18322 Täby, Sweden
Tel: 08 638 72 00

Filiale Italiana
Via Fabio Filzi, 25/A
20124 Milano, Italy
Tel: 02-667541

Branch The Netherlands
Steijgerweg 6
5616 HS Eindhoven
The Netherlands
Tel: 040 265 40 10

[Asia & Oceania]

NEC Electronics (China) Co., Ltd
7th Floor, Quantum Plaza, No. 27 ZhiChunLu Haidian
District, Beijing 100083, P.R.China
Tel: 010-8235-1155
http://www.cn.necel.com/

Shanghai Branch
Room 2509-2510, Bank of China Tower,
200 Yincheng Road Central,
Pudong New Area, Shanghai, P.R.China P.C:200120
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